

DOCUMENT RESUME

ED 265 066

SE 046 367

AUTHOR Chase, Valerie; And Others
TITLE Educator's Guide to the National Aquarium in Baltimore.
INSTITUTION National Aquarium in Baltimore, MD. Dept. of Education.
SPONS AGENCY Baltimore County Commission on Arts and Sciences, MD.; Baltimore County Public Schools, Towson, Md.
PUB DATE 84
NOTE 123p.; For related documents, see SE 046 364-366. Filmstrip that The filmstrip that accompanies the document is available separately from the Aquarium (\$4.00).
AVAILABLE FROM National Aquarium in Baltimore, Pier 3, 501 E. Pratt St., Baltimore, MD 21202 (\$4.00).
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Animals; Elementary School Science; Elementary Secondary Education; *Exhibits; *Field Trips; Learning Activities; *Marine Biology; Marine Education; *Science Activities; *Science Education; Science Teaching Centers; Secondary School Science; Wildlife
IDENTIFIERS *Aquariums

ABSTRACT

This guide is designed for educators planning trips to the National Aquarium in Baltimore. The first part provides tips on organizing a school visit and information on the aquarium lobby and exhibits. These exhibits are: (1) Maryland: Mountains to the Sea; (2) Surviving through Adaptation; (3) North Atlantic to the Pacific; (4) South American Rain Forest; (5) Atlantic Coral Reef; (6) Open Ocean; and (7) Marine Mammals. The second part consists of a chaperone's guide to the aquarium and 27 activities. The activities (which cover a wide range of topics and include, when applicable, suggestions for pre- and post-trip activities) are not divided by age or grade level since children's abilities vary. The last part includes the script for and titles of 56 slides which can be used to prepare a class for a trip to the aquarium, together with reasons why they should be used. An update of information about the exhibits is appended. (JN)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as
received from the person or organization
originating it.

Minor changes have been made to improve
reproduction quality.

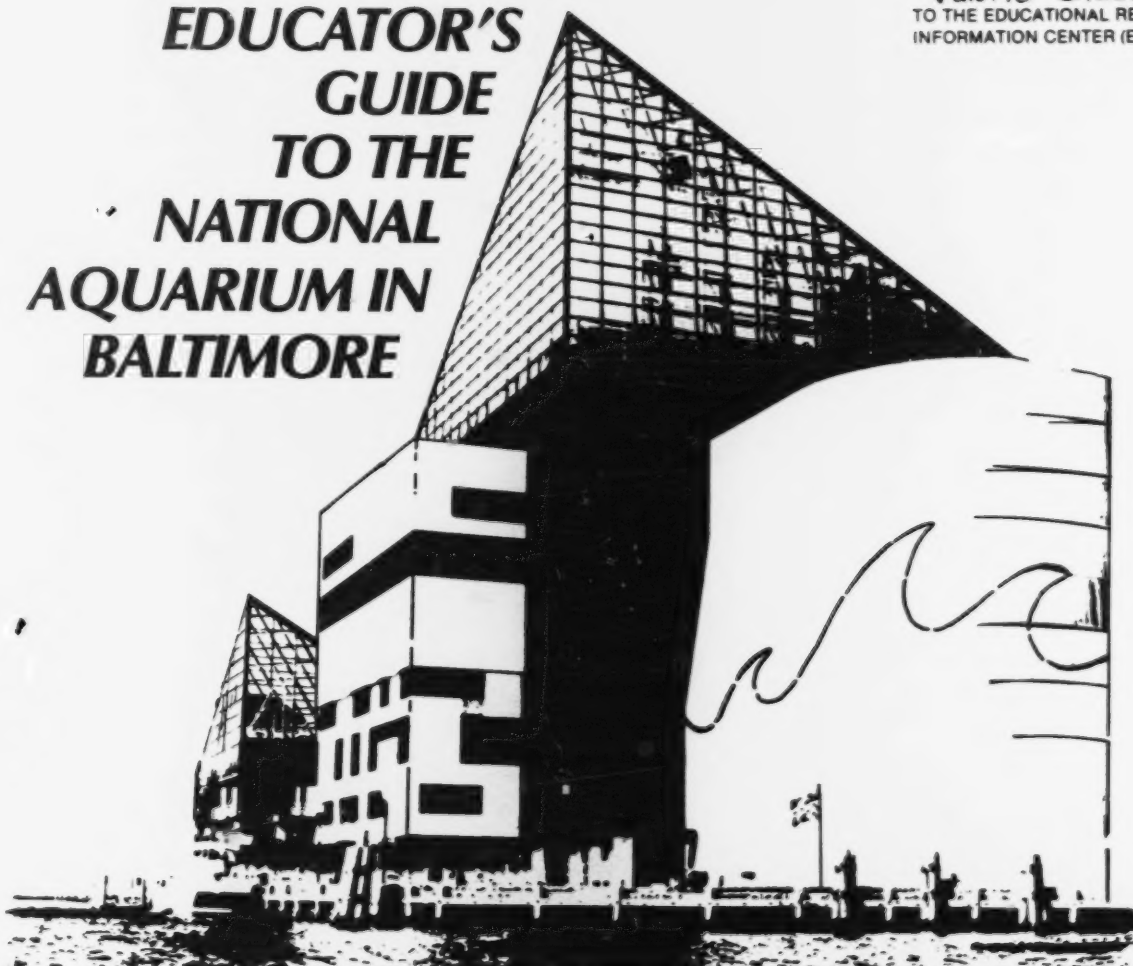
Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

National Aquarium
in Baltimore

Valerie Chase
TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

**EDUCATOR'S
GUIDE
TO THE
NATIONAL
AQUARIUM IN
BALTIMORE**



Written by Valerie Chase and others in the Education Department,
National Aquarium in Baltimore

Activities contributed by Al Shulley, Rick Shipley
and Mary Thurlow, Baltimore County Public Schools

© Copyright 1984 National Aquarium in Baltimore
Any part of this book may be reproduced for educational purposes.

Illustrations

Joyce Hebst

Ivan Ferron

Design

Charles West

Photography

Valerie Chase

Richard Anderson

Gary Baese

EDUCATOR'S GUIDE UPDATE

SUMMER 1985

Please insert this sheet in your copy of the Educator's Guide to the National Aquarium in Baltimore. It will update the exhibit information contained in the Guide. Each year the Aquarium changes and grows, providing new and different things to see and learn. These changes help the Aquarium stay an exciting and dynamic place to visit.



LOBBY—LEVEL 1

The Lobby is being changed slightly to provide better visitor services. The desk to the extreme right will become a checkroom. The Health Department will still not allow us to check lunches however, so the rule "no food in the Aquarium" remains in effect. The Information Desk is moving to a more central location. The original gift shop, Puffin Place, remains, but a second shop featuring books, posters, artwork and other more expensive items is moving into the Man and the Sea area at the end of your trip through the Aquarium.

MARYLAND: MOUNTAINS TO THE SEA—LEVEL 2

This gallery remains essentially the same. The snapping turtle was removed from the Allegheny Pond when he grew large enough to threaten the existence of the rest of the residents. The Assateague Beach was completely renovated, including a new, more realistic mural.

SURVIVING THROUGH ADAPTATION—LEVEL 3

This gallery has had a number of changes and will continue to evolve during this year. The program scheduled for Habitat Theater for at least part of the year concerns the current status of the Chesapeake Bay.

The first exhibit in the gallery, Evolving (Changing), remains a comparison of natural selection and selective breeding by humans. However, the cichlids (natural selection) have been moved across the gallery to the old Schooling location which provides a much larger display. Look for cichlids mouthbrooding developing eggs and newly hatched young or defending swimming offspring from predation.

The old cichlid display is now devoted to electric fish. A system of electrodes and an amplifier translate the electrical discharges of the eel into sound. The new graphics panel discusses the use of electric systems in fish for navigation, communication, defense and predation. We could not resist the temptation. This new display is called Shocking.

The nature of the Occupying exhibit will change radically this year with the installation of a living coral reef exhibit to replace the three small tanks currently on line. This project should be completed by late fall of 1985. In an effort to show the features of a real reef, a variety of Caribbean fish and invertebrates will make their home on the living reef. This is an exciting new development since it is very hard to keep corals alive in a captive environment. One of the two new graphics panels will discuss the problems and solutions encountered in creating this exhibit while the other features the unique relationship of corals with the tiny single-celled algae that live inside their tissues.

NORTH ATLANTIC TO THE PACIFIC—LEVEL 4

Please remember that the Sea Cliffs exhibit (puffins, mures and razorbills) is closed for cleaning one morning each week. Currently that day is Wednesday. The birds generally go back on display by 12:30pm.

The Children's Cove remains the same, but is being considered for a major rehabilitation that would enlarge the area, improve accessibility and facilitate animal care. This change is in the initial planning stages and a timeline has not been established.

A new information desk will be located at the top of the moving walkway leading to Level 4. It has not yet been installed as of this writing.

SOUTH AMERICAN RAIN FOREST—LEVEL 5

New species are added periodically. Two of the most prominent additions are the common trumpeter (large black and gray birds) and scarlet ibis. A second two toed sloth has been released, and both animals are being allowed to roam freely through the forest. The volunteer Exhibit Guides should be able to help you locate them. The acouchi have been removed and sold to a zoo.

The darkened hall at the end of the rain forest pathway known as the Gem Hall for its small, gemlike exhibits currently features poison arrow frogs. It is the best collection of its kind in the country. The small reptiles and amphibians normally on display here rotate so that each can be displayed. Future plans call for enlarging the exhibits here and adding more species.

A new identification label system with color pictures should help your students put names to the birds and other animals they see in the rain forest. Remember to look for the volunteer Exhibit Guides also.

WESTERN ATLANTIC CORAL REEF—LEVEL 4 AND 3

New specimens are added routinely, but there has been no major change in the species on display. A diver communication system now allows the diver doing the 1:30pm feeding to hear and answer questions from the visitors.

A small sawfish, a cartilaginous fish, is in temporary residence in the coral reef until it grows large enough to join its relatives in the Open Ocean exhibit.

OPEN OCEAN (SHARKS)—LEVEL 1

No major changes.

MARINE MAMMALS—LEVEL 1

In the outdoor Seal Pool, five harbor seals (two males and three females) and two gray seals (one each male and female) are currently on display. These numbers could change since one female of each species is pregnant. First pups frequently do not survive, so everyone has fingers crossed.

The species which will be on display in the indoor Central Pool is not absolutely certain at this time. Changes have been made and continue to be made to improve this area. Sea lions will probably not be here when you visit so do not plan to use the Sea Lion worksheet.

The development and initial production of this educator's guide to the National Aquarium in Baltimore was supported by a grant from the Baltimore County Commission on Arts and Sciences and the help of the Baltimore County Public Schools Office of Science. Its goal is to improve observation, learning and behavior on the part of school and other children's group visits to the Aquarium.

*Education Department
National Aquarium in Baltimore*

CONTENTS

	Page	Aquarium Location
ORGANIZING A SCHOOL VISIT	1	
LOBBY	5	Level 1
MARYLAND: MOUNTAINS TO THE SEA	7	Level 2
SURVIVING THROUGH ADAPTATION	13	Level 3
NORTH ATLANTIC TO THE PACIFIC	19	Level 4
SOUTH AMERICAN RAIN FOREST	27	Level 5
ATLANTIC CORAL REEF	35	Level 4 and 3
OPEN OCEAN	41	Level 1
MARINE MAMMALS	47	Pier and Level 1



Richard Anderson

ORGANIZING A SCHOOL GROUP VISIT

The National Aquarium in Baltimore is designed to be an excellent educational resource, but planning and preparation will determine how much your children learn during their visit. You may sign up for a special program given by the Aquarium staff; however, it is your work with your students which will insure the success of your trip. Please make the Aquarium a part of your classwork ahead of time and do follow-up work after the visit. Your children will learn more, and the experience will be more pleasant for you and for our other visitors.

This Aquarium guide will help you with your planning. It includes activities designed by Baltimore County teachers and Aquarium staff. Some are for use in preparation for your trip; others can be done during or after your visit. The slide set enclosed will help prepare your students for the complicated structure of the building and guide them in carefully observing the exhibits.

Just a few reminders:

- There are *no guided tours* of the Aquarium. The Education Staff provides special programs by reservation. The teacher and chaperones lead their children through the building after having a program.
- All children, regardless of age, *must* stay with their chaperones. Ideally, you will divide your class into small groups which can travel independently with their chaperones. This should be done well in advance of your arrival. Everyone should also know where and when to meet at the end of your visit. Plan about 1¼ to 1½ hours for the trip through the Aquarium. Add ½ to ¾ hour if you are attending a prescheduled program.
- Neither food nor drinks may be brought into the Aquarium.
- Smoking is not allowed anywhere, including the restrooms.
- Running, pushing and shouting scare the animals and ruin the experience for other visitors.
- Teachers and chaperones may not bring their own small children.
- Schools which cause problems may be exempted from sending groups to the Aquarium in the future.
- Group rates and free admission apply only to school groups which have made advance reservations.

Please refer to our current school brochure for details on programs and reservation procedures. To receive a brochure call (301) 576-3800.

AQUARIUM INFORMATION

The National Aquarium in Baltimore was named by an Act of Congress, but it is not federally funded. It was granted national status as one of the largest and most comprehensive aquariums in the country. The Aquarium building is owned by the City of Baltimore and managed by a private, non-profit corporation. Funding is provided by admission charges, memberships, grants, donations and gift shop sales.

EXHIBIT PHILOSOPHY

The exhibits are designed to do more than display certain species of animals. The Aquarium uses a habitat approach that encourages understanding of the environment in which the animals live and the animals' relationships with each other. The exhibits recreate natural environments or habitats. Artificial additions to our exhibits like the "corals" and "kelp" are made from molds of real specimens and are accurate in detail. In addition to improving the visitors' understanding of the ecology of our animals, exhibits that feel and look like "home" create a healthier environment for the animals.

Exhibits change as the Aquarium develops and grows. Technical problems may require occasional closing or changing of exhibits. Exhibits may also be moved. Consequently, some material in this guide may be dated.

GRAPHICS

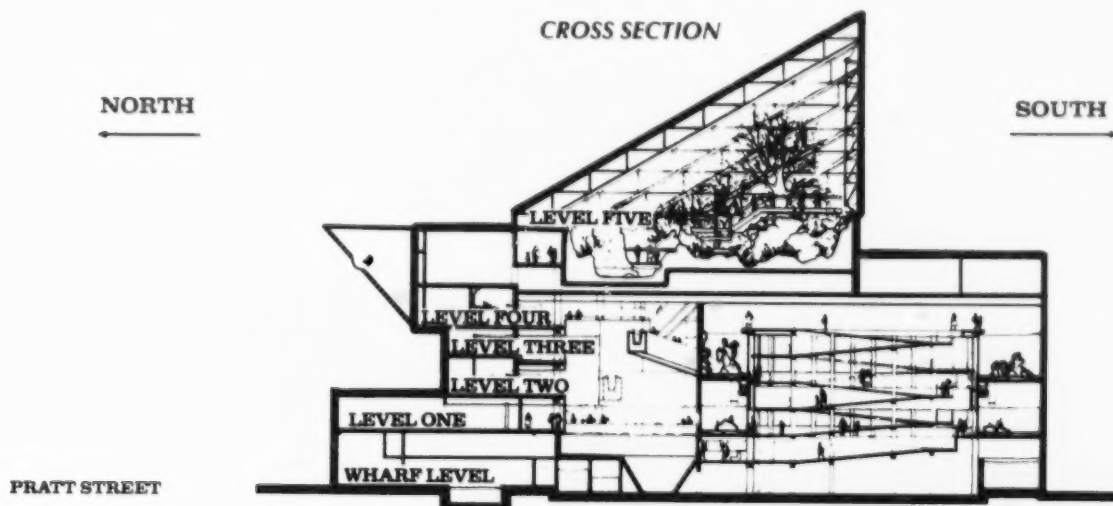
You will find a great deal of good biological information, collectively known as the "graphics", on the Aquarium walls. Transparent panels and identification labels lighted from behind display information which will help you learn about the exhibits. The Aquarium must be kept dark to reduce glare which would prevent you from seeing into the tanks.

At the beginning of each gallery is a large panel of information which introduces you to the theme of the exhibits on that level—Maryland: Mountains to the Sea; Surviving through Adaptation; North Atlantic to the Pacific; Rain Forest; and Atlantic Coral Reef. Maps are included to help you visualize the location of these habitats.

At each individual exhibit window are graphic panels that discuss the biological principles demonstrated or the particular habitat displayed.

The name of each exhibit is located on the upper right of each exhibit. The identification labels for individual species on display are located in a box along the bottom of the tank or in the railing in the Rain Forest, Atlantic Coral Reef, and Open Ocean and marine mammal exhibits.

MOVING AROUND

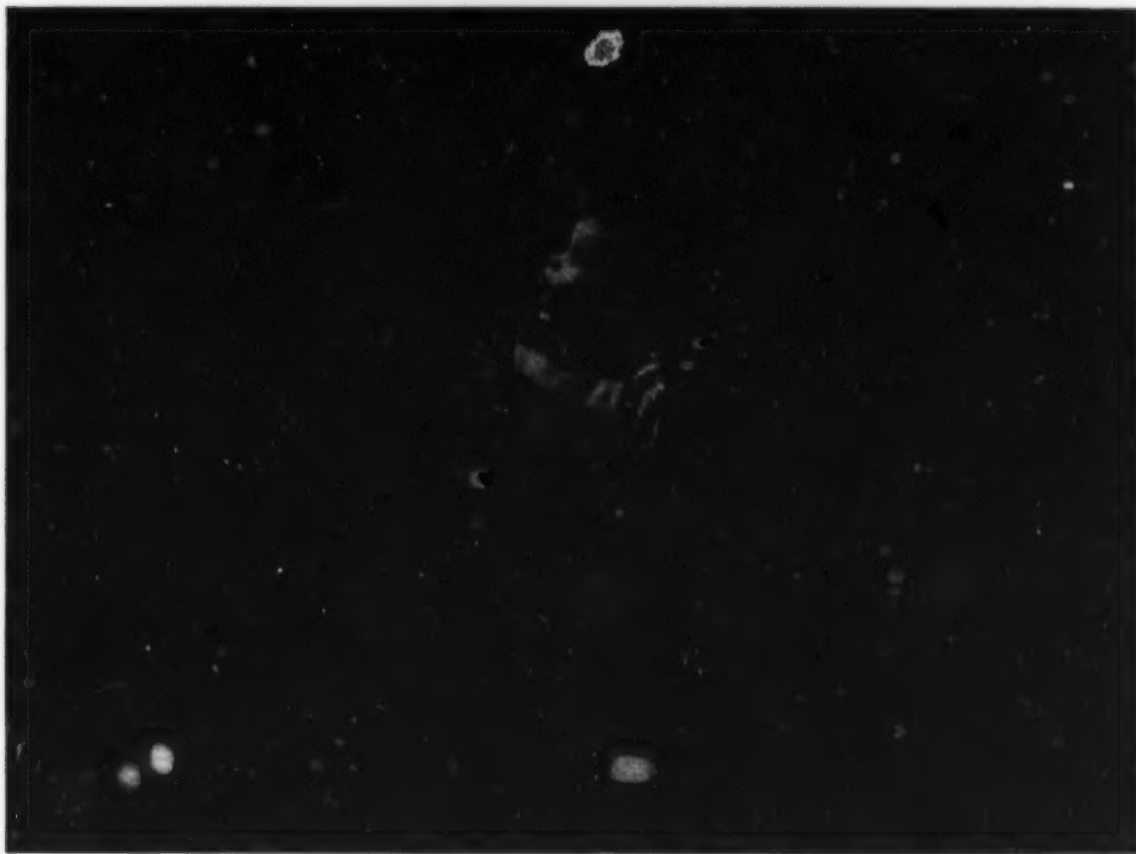


Your class will enter the Lobby two stories above the wharf. This is our first public level, designated Level 1. Please refer to your contract for entry instructions. From the Lobby your group will move up through the northern side of the building using a combination of escalators and moving walkways. From Level 4 an escalator will carry you up to the Rain Forest. Leaving the Rain Forest on another escalator, your class will descend to the top of the ring tanks at the south end of the Aquarium.

A series of spiral ramps descend through the Atlantic Coral Reef and Open Ocean ring tanks to an underwater viewing area below Level 1. From the underwater area return to the Lobby by going up the escalator. The gift shop, Puffin Place, is at the end of this route.

Handicapped persons who cannot use escalators enter at the Security/Staff entrance by the Seal Pool on the west side of the building. They will be directed to an elevator. A public elevator is available for transport to each level. Wheelchairs are prohibited on moving walkways and escalators.

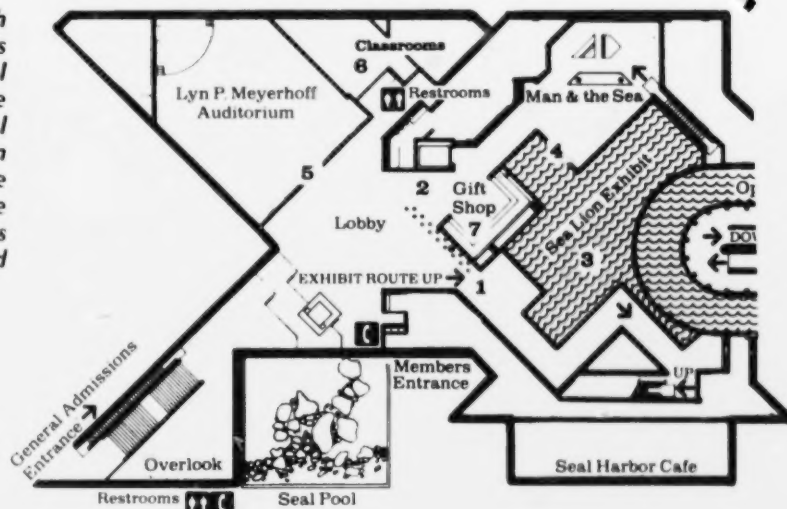
Physically limited persons may have problems negotiating the building due to crowding or subdued lighting. Crowds are usually reduced in late afternoon. Please contact the Education Department if you have specific questions.



Richard Anderson

LOBBY—LEVEL 1

LEVEL ONE: Your trip through the Aquarium begins (1) and ends (2) in the lobby on Level 1. Level 1 affords an excellent view of the central space, marine mammal pool (3) and a slide sequence on the history of diving (4). The Lobby also offers access to the Auditorium (5) and classrooms (6). The gift shop (7) is located here at the end of your trip.



INTRODUCTION TO THE AQUARIUM

The Lobby is your introduction to the Aquarium. As you enter, you will see a colorful fish mural. The Auditorium and classrooms are located behind this wall. Restrooms and drinking fountains are at the end of the passage along the mural wall to your left.

A series of blue "bubble tubes" to your right guides your group along the beginning of their Aquarium tour. Children love these tubes. They are not a part of our water treatment system, but rather a delightful decoration which sets the mood for a trip through our watery world. The main pumps and filters are located below the exhibit areas. As you approach you will hear bubble sounds. These are the first of many sounds heard as you tour the Aquarium.

Before you leave the Lobby, check the Information Desk to your extreme right for feeding times, special events and route maps for chaperones. Start your tour to the right. Do not go straight ahead toward the gift shop. If you do, your group will be moving backwards, against the flow of traffic.

As you move out into the central space, pictures, sounds and live animals will all reinforce the theme, "The Unity of Life through Water". Water environments are everywhere. Marine mammals frolic below and the skeleton of a fin whale "dives" overhead. Ahead your class will get their first glimpse of the sharks. A crowd forms near the sharks. You will have a long, uncrowded visit with the sharks later, so you need not linger.

MOVING ON

Your class will turn right at the shark viewing window and go up an escalator to Level 2. As you move, pictures overhead illustrate "The Many Shapes of Water" while aquatic and marine animal sounds set the mood. Can you distinguish the bull frogs and elephant seals? The sounds are loud, and small children may be alarmed.



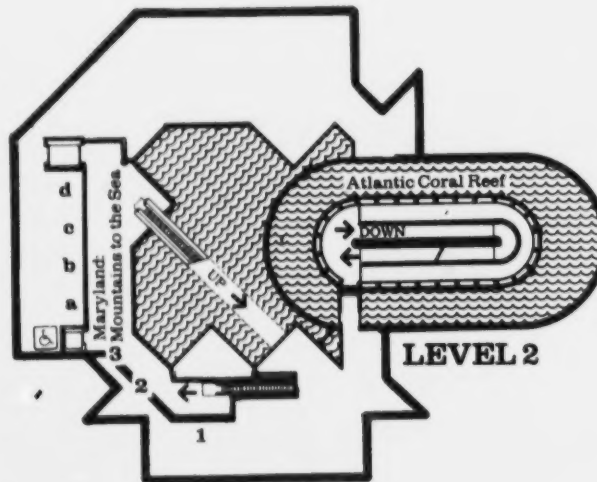
Valerie Chase

If you have handicapped students, you will retrace your steps to the Lobby. An elevator is located down the hall to the right of the Information Desk. It will take you to Level 2 and all other levels.

MARYLAND: MOUNTAINS TO THE SEA— LEVEL 2

LEVEL TWO: At the top of the escalator is a wall of pictures (1) which reinforce the concept that all living things require water.

Level 2 has four exhibits which represent a biological cross section of the state of Maryland. They demonstrate the path that water takes as it flows from the Allegheny Pond in the mountains (a), through a salty Tidal Marsh (b), to the coastal Assateague Beach (c), and the Atlantic Continental Shelf (d) offshore. The graphic panels discuss this path (2) and the water cycle (3) of evaporation, condensation, precipitation, and run off to the sea.



WATER CYCLE

Weather is a fascinating topic. People who have nothing else in common can still discuss the weather. Weather determines the pattern of our lives. The water cycle is a part of it. Since the Aquarium theme emphasizes the importance of water to all living creatures, the water cycle is an excellent way to start a tour. It is explained in a graphic panel to the left of the elevator.

Water evaporates from seas, ponds, lakes, streams and the land and is also lost from plant leaves through transpiration. Winds carry this water vapor aloft. As it rises in



Valerie Chase

altitude, water vapor is chilled. It begins to condense in drops on dust particles just as dew condenses on your car on a chilly morning. When the growing drops become heavy enough, they fall as rain. In cold weather, the drops may become snow, sleet or hail. Because water vapor is carried high over mountains into the colder upper atmosphere, precipitation is greater in the mountains. Your tour of the water cycle in Maryland starts with rain in the Appalachian Mountains at the Allegheny Pond.

ALLEGHENY POND

From mountain ponds and streams, water flows down toward the sea. Originally beavers built the dams which created ponds, but few survive today. All lakes and most ponds in the Maryland mountains are man-made. These ponds are often stocked with fish in addition to the animals that migrate in on their own.

Ponds are shallow bodies of water. Underwater plants or pondweeds can root and grow anywhere on the bottom. Tiny single-celled plants (algae) called phytoplankton, pondweeds and leaves from nearby trees serve as food for plant-eaters (herbivores) in the pond food chain. Pond water is alive with tiny animals called zooplankton feeding on the algae. Some are single-celled like the Paramecium while others are bigger like the busy water flea.

Larger pond animals include a wide variety of insects. Some skate on the surface of the water, supported by surface tension. Others swim or crawl along the bottom. Many insects, such as stoneflies, mosquitoes and dragonflies spend only their juvenile stages in the water. Amphibians, including salamanders, toads and tree frogs also use ponds as nurseries. Their jellylike egg masses release tadpoles which metamorphose (change) into adults and leave the water. Only certain frogs remain as adults.

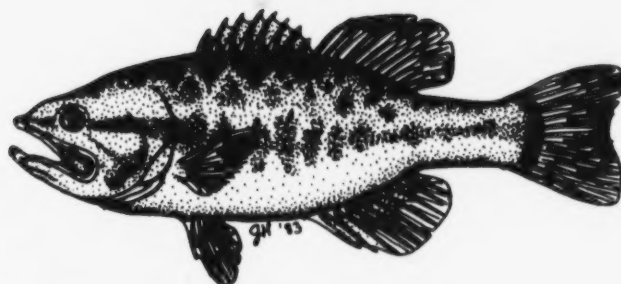
Birds search for fish and insects or nest along pond shores, while turtles paddle about or sun themselves on logs. Fish feed on insects, small frogs and salamanders. Maryland pond fish include members of the sunfish family and catfish, perch, and trout.

Snapping Turtle—Snapping turtles are predators that eat almost any pond plant or animal. Their powerful jaws and long necks make them very difficult to handle safely. They are common in ponds all over the United States. Most of their time is spent underwater.

Eastern Painted Turtle—These turtles get their name from the bright yellow patches on their head. During warm weather painted turtles bask in the sun for much of the day, alternating basking with foraging on aquatic plants and animals.

Channel Catfish—Channel catfish are frequently stocked in ponds. They use their barbels (whiskers) to find food on the bottom at night. They will eat both plants and animals.

Sunfish—The sunfish family includes many small "panfish" like crappies, pumpkin seeds and bluegills. They are very widely distributed because they are frequently stocked in natural and man-made ponds.



Large Mouth Bass—These hungry predators lurk in ponds, waiting for the smaller fish and amphibians they prefer. Bass are a popular sportfish because they put up such a good fight.

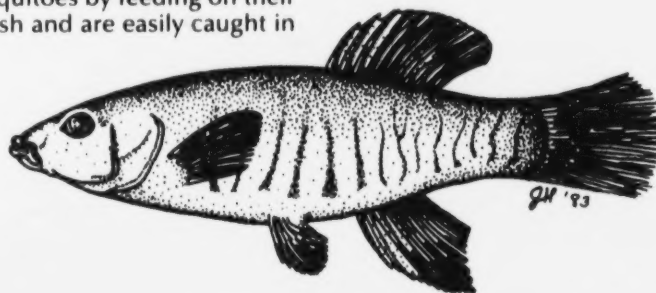
Carp—Carp are giant goldfish which were introduced into North America in about 1870. They originated in Asia and have also been introduced to Europe. Carp feed primarily on algae. They are frequently eaten in other countries.

TIDAL MARSH

Tidal marshes occur along the shores of the Chesapeake Bay and Atlantic coastal lagoons. Here fresh water, delivered from the mountains by streams and rivers, flows into and mixes with salt water from the sea. These marshes are dominated by cordgrasses which are well adapted to marsh life. Their roots live in mud with no oxygen. Oxygen gets to the roots through tubes in the stems. While cordgrass is too tough for most animals to eat directly, it still forms the basis of the marsh food chain. As cordgrass decays, bacteria and fungi grow on it. It fragments into tiny particles called detritus. Animals like oysters and mussels can feed on this now digestible detritus. Thus the marsh is said to have a detrital food chain.

Many animals live in the tidal creeks of the marshes including diamondback terrapins, killifish, mud snails, oysters and blue crabs. Fiddler crabs live on the mud banks; their burrows are exposed at low tide. Periwinkles, snails that move up and down the cordgrass leaves with the tides, browse on algae growing on the grass blades. Birds are abundant in the marsh, particularly the long-legged, long-necked, fish-eating herons.

Killifish—Killifish are very abundant in salt marshes. They are well adapted to the extreme variations of salinity, temperature and oxygen that occur in tidal marshes. Long-legged, wading birds like the great blue herons or egrets are particularly fond of killifish. Killifish help control mosquitoes by feeding on their larvae. They are also useful as bait fish and are easily caught in minnow traps.



Blue Crabs—These aggressive crabs forage along the bottom of tidal creeks in salt marshes, looking for small invertebrates or scavenging on larger animals. They are eagerly sought for their tasty meat by both humans and natural predators like raccoons.

Diamondback Terrapin—These gentle turtles feed on molluscs and small crabs. They live in the brackish water of salt marshes or mangrove swamps along the East Coast to Mexico. They were hunted almost to extinction and are gradually returning to good numbers. The University of Maryland, College Park uses the diamondback as a mascot, hence the Maryland Terrapins.

ASSATEAGUE BEACH

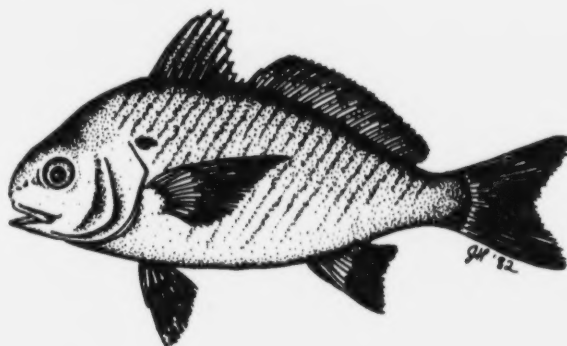
Sandy beaches and barrier dunes may form where the restless Atlantic Ocean assaults flat shores with waves, tides and storms. Constant shifting and reworking of the sands, pounding waves, alternate soaking and drying by tides—all make the beach an inhospitable habitat. Plants have no foothold here, except high on the more stable sand dunes. Many animals tend to live buried in the sand and are fast diggers such as sand crabs (mole crabs), clams, and moon snails. Others like the shore birds who rush down the beach in search of food move out of the way when the waves return.

The fish found offshore are many of the same species that are caught in the Chesapeake Bay. During their seasonal migrations, these fish lure surf fishermen to the beaches. These species include bluefish, weakfish and striped bass.

The sands shift with time. The beaches that form barriers between sea and land are constantly changing. Rising sea level, severe storms, and unusual tides can dramatically alter the dunes and beaches. Beach animals are adapted to these changes. Humans try to ignore them. Building homes on sandy beaches reflects our unwillingness to recognize beach instability. We forget one hurricane can totally change our coastal maps.

Puffer—As the name implies, puffers are able to enlarge their body when threatened. They puff up with water or air. Puffers live near shore and feed on small invertebrates which they crush with bony plates at the front of their mouths.

Spot—These small fish are incredibly abundant at times and serve as food for larger predators like bluefish. Like other members of the drum family, they make a "croaking" sound when caught.



Killdeer—These birds hold very still for long periods, a behavior that combines with their camouflaged color to make it hard for predators to see them. Because of this behavior visitors often think the Aquarium's killdeer are stuffed specimens. Like all plovers, they frequently stand on one foot, "resting" the other against their body. Killdeer are noted for feigning injury to draw a would-be predator away from their exposed nest on the ground. Our killdeer are captive-bred birds which are thriving in this exhibit.

ATLANTIC CONTINENTAL SHELF

Under the shallow seas off our coasts are extensions of the continental land mass, our continental shelf. Runoff carries nutrients from the land to enrich these coastal waters. These nutrients encourage the growth of the tiny plants—phytoplankton—on which the marine food chain is based. Consequently, fish are more abundant here on the shelf where plants are abundant rather than further offshore in the deep ocean. Both sport and commercial fishing are supported by these fish stocks. The 200 mile limit for fishing regulation by the U.S. government indicates our recognition of the importance of shelf area fisheries. Prior to enactment they were being over-exploited by fishing fleets from many nations, including Japan and Russia. Permits and limits are set for each nation in our coastal waters. Pollution from offshore oil drilling and waste dumping can also threaten the rich fisheries of the continental shelf.

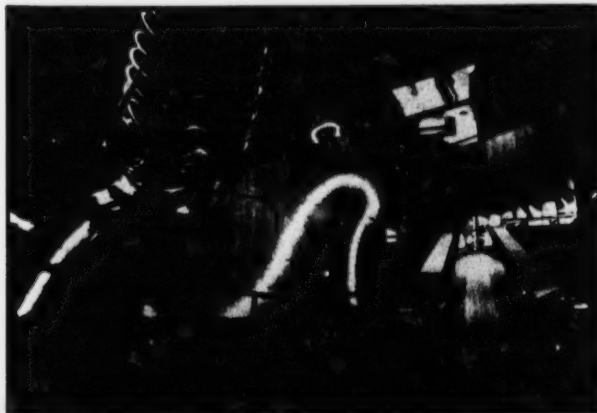
Weakfish—Weakfish are also known by the common name sea trout but they are not related to freshwater trout or salmon. These fish are popular with sport fishermen who catch them in coastal waters and the lower Chesapeake Bay.

Sea Bass—These large, sedentary fish are found in rocky areas where they quietly lurk until a meal swims by. Their dark color makes them blend in with the rocks. When bass find a spot they particularly like, bass will defend it against intrusion by other bass.

MOVING ON

Now you will take the moving walkway located across from the Atlantic Continental Shelf exhibit to Level 3.

If you have handicapped children, you will retrace your steps to the elevator to the left of the Allegheny Pond.



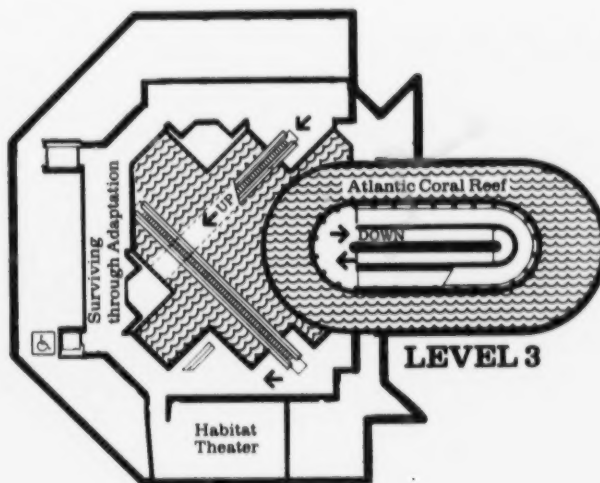
Valerie Chase



Richard Anderson

SURVIVING THROUGH ADAPTATION— LEVEL 3

LEVEL THREE: This level demonstrates some of the kinds of adaptations found among animals that live in water. Both fish and invertebrates are featured. This gallery tends to be crowded on days of heavy visitation. Please do not use worksheets on this gallery. If your time is limited, you may want to skip parts of this gallery. Habitat Theater is located behind the wall of pictures near the start of Level 3.



CLOSE-UP GRID WALL Close up pictures demonstrate adaptations of parts of fish and invertebrates—tails, fins, eyes and mouths are featured. This is an excellent place to stop and study specific structures. The pictures are identified with small labels on the lower right hand corner of the metal frame.

SLIDES Plants that are too small to see without magnification are projected on the wall across from the grid wall. These are the phytoplankton (tiny algae) which form the lowest step of marine food chains.

HABITAT THEATER This multi-media theater opened with an 8½ minute multi-image slide program, "Voices Out of the Blue". This program demonstrates the way sounds are used by aquatic animals ranging from pond animals to humpback whales.

ADAPTATION

An adaptation is a special modification of a plant or animal that makes it more fit for existence under the conditions of its environment.

Animals are adapted in many ways that allow them to survive in the water. They have developed specialized appendages (fins, legs, tentacles) that help them catch food, move through the water or defend themselves from predation. Their body shapes are adaptations that allow them to move easily through water or attach firmly to surfaces. Color patterns may camouflage animals and disguise their shape and size from predators. These adaptations have come about because of competition for necessities such as food, space, or a mate or because of predation.

There are hereditary differences within members of the same species. Just as some people are taller or shorter or have other inherited physical differences, all animals within a species have differences that can be passed on to succeeding generations. Some of these characteristics are more beneficial than others and, in extreme conditions, might make a difference in how well an animal can live in its environment. The animals with characteristics that will improve their ability to live well are most likely to reproduce and pass those beneficial characteristics on to succeeding generations. After many generations all the animals in a group will have these beneficial characteristics or adaptations. This process in which the environment selects individuals with favorable characteristics as the parents of the next generation is called natural selection.

The production of adaptations in a species generally occurs gradually, but sometimes the process is more rapid under extreme conditions. For example, our use of pesticides has produced pesticide-resistant insects in just a few years. Those insects which are adapted to an environment with pesticides produce more offspring. Eventually all the insects in a population are adapted to the pesticide.

SURVIVING THROUGH ADAPTATION EXHIBITS

CHANGING This exhibit demonstrates the range of characteristics which have evolved in one group of fishes, the cichlids (pronounced "sicklids"). While occupying three lakes in Africa, cichlids have given rise to several hundred species with different adaptations for feeding and breeding particularly in evidence.

One of the most interesting breeding specializations in cichlids is mouth brooding. The female lays eggs which she collects in her mouth before they are fertilized. The male has a spot or spots on his anal fin which resemble eggs. As the female goes to pick up the "dummy eggs", he releases sperm which fertilizes the eggs in her mouth. She carries the developing eggs until well after they hatch; hence the term "mouth brooder".

SCHOOLING Schools are groups of uniform size fish swimming in the same direction. We do not know for sure the advantage of this behavior. Theories include finding food, confusing and eluding a predator, and reducing the chance of a predator finding fish. We know that a school has no leader. If any one fish turns, they all turn. Fish use a combination of vision and sensitivity to vibrations from neighboring fish to maintain their position in the school.

FEEDING Not everyone eats with a knife and fork. Among the variety of feeding mechanisms displayed here are:

- sea horses who slurp food into their tube-like mouth like an eye dropper sucking water.
- sea urchins which scrape algae with chewing, rasping mouth parts called Aristotle's lantern.
- hermit crabs that pick bits and pieces of food with small clawed appendages.
- tubeworms which filter tiny bits of food out of the water with their feathery tentacles.

Hermit Crabs—Hermit crabs wear shells from snails. They retreat into their shell when threatened. As the crabs grow, they must find new shells. Good snail shells may be scarce, and crabs fight over a particularly desirable shell on occasion.



Sea Horses—Sea horses are not strong swimmers. They spend much of their time clinging to sea grasses with their tails. When zooplankton drifts by, the sea horses slurp up their unsuspecting prey.



FEEDING This feeding exhibit usually compares an active predator like the octopus or spiny lobster with a passive, attached predator, the sea anemone which uses stinging cells in its tentacles to catch and immobilize prey that blunder into it. The sea anemones share their home with a host of other interesting invertebrates, so look carefully. We do not always have an octopus. The Pacific octopus is very hard to keep in captivity. It requires very clean, very cold water and dies after reproducing once.

MOVING Fin power moves the most numerous group of vertebrates—fishes. Compare some of the different ways fish in this exhibit use their fins to propel themselves through the water. Not all fish get swimming power from their tails!

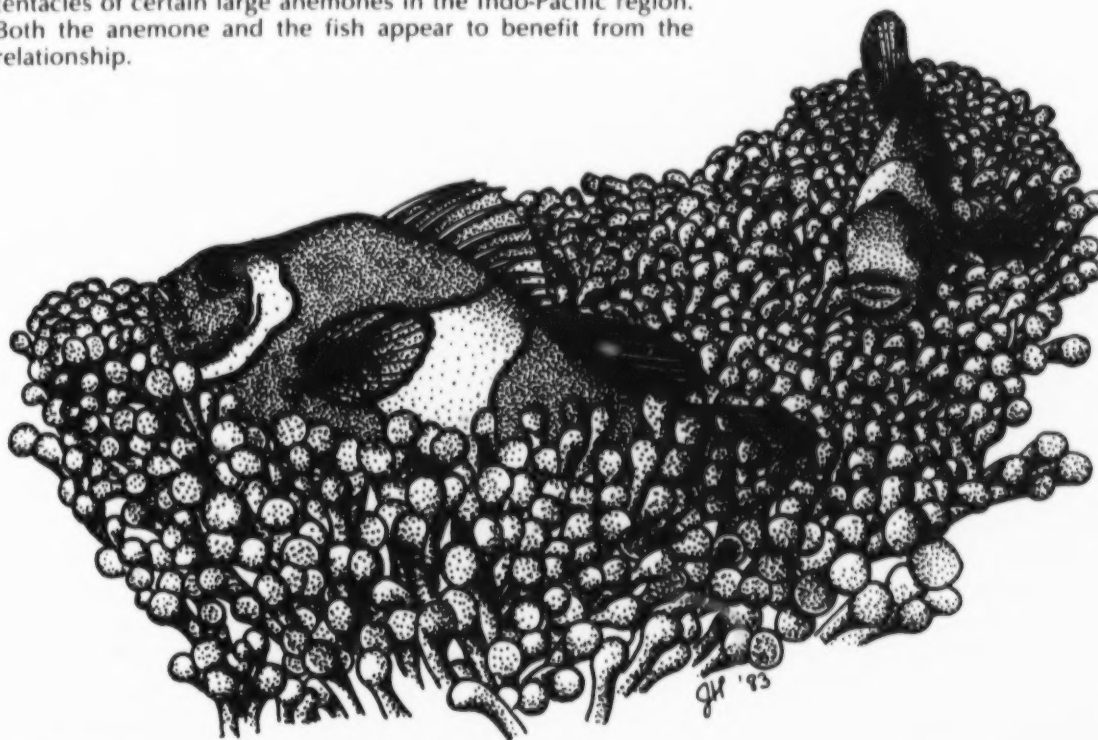
LIFE IN THE DEEP Pictures and a slide show on the opposite wall show some of the adaptations of deep sea fish to life in the deep dark sea. Look for tiny males that are parasites on larger females and angler fish that wiggle a lighted (bioluminescent) lure in front of very large jaws to lure unsuspecting prey.

GROWING Some fish just keep growing. The largest fish is the whale shark, but our moray eels and groupers are pretty large and growing all the time. Other fish are full grown at less than an inch.



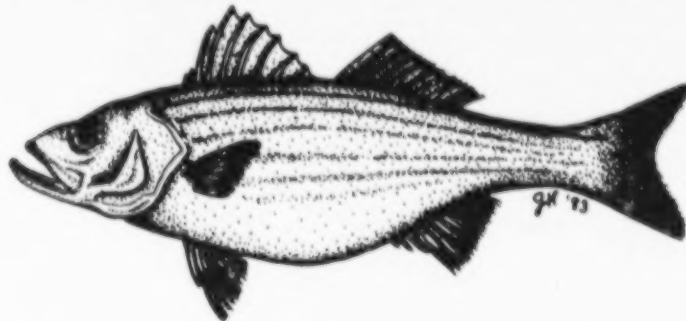
OCCUPYING Animals are adapted to living in different kinds of places. Some even live in or on other animals as do the clownfish, safe among the stinging tentacles of their anemone hosts. Other fish occupy a territory and defend it.

Clownfish—Also called anemonefish, clownfish live among the tentacles of certain large anemones in the Indo-Pacific region. Both the anemone and the fish appear to benefit from the relationship.



HIDING AND DISPLAYING Both the stonefish and scorpionfish have toxic spines, but prefer to hide rather than fight. They are well camouflaged. Look carefully! The lionfish also has toxic spines on its fins, but it spreads them in a display to scare possible predators when they venture too near.

MIGRATING Many fish migrate to reproduce or to follow food supplies. Some, like the striped bass (rockfish), live and feed in salty water, but move to fresh water to spawn (lay



their eggs). In contrast, the American eel lives in fresh or brackish water, but migrates thousands of miles to breed in the Sargasso Sea in the middle of the Atlantic. In the spring hungry bluefish migrate into the Chesapeake Bay, following schools of menhaden and other small fish.

LURKING Living in the darkness of the deep sea can be made simpler if a fish has a light to help it find a mate or attract food. The actual light is produced by bacteria living on the fish. They use a chemical reaction to make light. The process is called bioluminescence.

SKELETONS Many groups of land-living animals have colonized the sea. The skeletons of some are displayed above you at the end of Level 3. From left to right are a sea turtle, porpoise and penguin while a fin whale dives from above. Compare their forelimbs to your own to see what modifications for swimming have occurred. Further to the right, an albatross flies over the open sea while a swordfish skeleton ranges below.

MOVING ON

Now you will again travel by moving walkway to the next level which shows habitats ranging from the cold North Atlantic to the warm South Pacific. On Level 4 you will find drinking fountains and restrooms at the top of the moving walkway to the left of the Sea Cliffs exhibit.

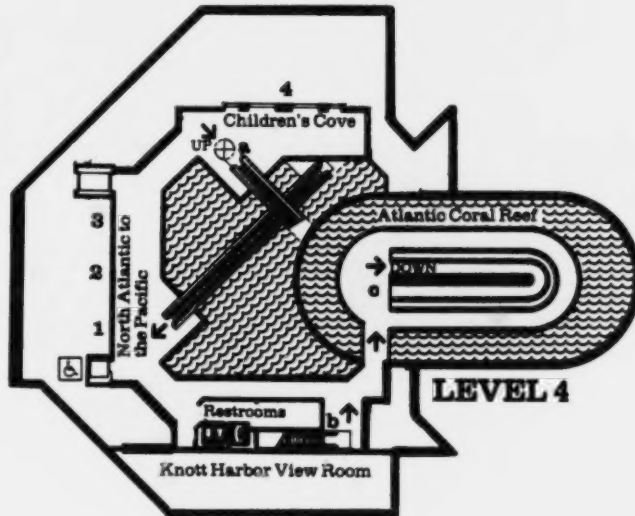
If you have handicapped children, you will retrace your steps to the elevator to the left of the schooling exhibit.



Richard Anderson

NORTH ATLANTIC TO THE PACIFIC— LEVEL 4

LEVEL FOUR: On Level 4 you will take a tour of the world, passing from the northern latitudes to the South Pacific. As you arrive on the traveling walkway, you will find the restrooms to your left and the route through the exhibits to your right. Here are the Sea Cliffs (1), Kelp Forest (2), Pacific Reef (3), and Children's Cove (4). Note the entrance (a) and exit (b) for the Rain Forest and the top (c) of the Atlantic Coral Reef.



SEA CLIFFS

This recreation of the rocky coast of Newfoundland contains three related species of birds that few people see in the wild. Puffins, murres and razorbills are pelagic (oceanic) birds. They spend most of their life away from land far out in the North Atlantic Ocean. When feeding, they dive after fish and shrimp-like krill, swimming with their wings, so that it appears that they are flying under water. They can also fly in the air.

While most of their life is spent at sea, puffins and their relatives must come to shore to breed. They lay eggs on sheer cliffs above the sea. Nesting space is at a premium as thousands of birds crowd the cliffs. Different species use different parts of the cliffs. Puffins burrow deep into the dirt at the top of the cliffs. Murres nest in groups on ledges, and razorbills, in cracks among the rocks.

Pictures of puffins show adults during the breeding season since those are the only birds available to photographers. The brightly-colored surface portion of the bill is found only on adults during the breeding season. It first develops in the fourth or fifth year and sloughs off when the birds are at sea between breeding seasons.

As is characteristic of many organisms which live in the open sea, these birds are dark above and white below. This coloration, called countershading, is typical of animals that live in open sea whether they are penguins, tuna, killer whales or puffins. It makes the animals less visible to predators swimming below or above them.

Because the Aquarium seabirds all have a black and white pattern, you have to observe carefully to tell them apart. The puffins have short, stout bills; the murres have long, thin bills; and the razorbills are intermediate in bill size. As the puffins mature, their bills and feet become more orange. If you are lucky, you may get to see these birds "fly" underwater. This behavior is most pronounced during twice daily feeding.

The puffin was chosen as the Aquarium mascot since it is equally at home in water, on land or in the air—a unique and charming bird.

Alcids—All three species belong to a bird family known as alcids. They use their wings to "fly" underwater to chase small fish and crustaceans. Visitors may confuse them with penguins which are also black and white. Penguins are larger, do not fly and are found in the Southern Hemisphere.

Puffins—The Aquarium's puffins are common puffins. Common puffins range over most of the North Atlantic. Because they were hunted and their eggs were collected for food, very few remain in the United States. The Audubon Society has undertaken to re-establish colonies in Maine now that they are protected by U.S. law. In countries like Iceland where puffins are still abundant, both adults and eggs are taken for market.



Murres—The common murres are the largest birds in this exhibit. They have the strongest flocking instinct of the three species.



Razorbill—Razorbills are the most aquatic of these birds. When pursued, they dive rather than fly. All three species were collected in Iceland as chicks and have been raised in captivity.



Richard Anderson

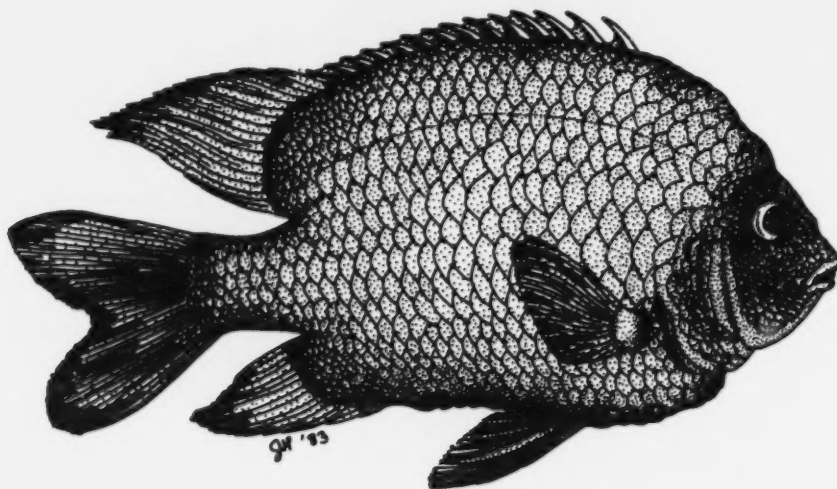
CALIFORNIA KELP FOREST

Off the California coast there are “forests” in the sea. They are made of kelp, a huge seaweed that grows in dense stands along rocky parts of the coast. Kelp is a kind of brown algae. Floats located below each frond are filled with gas. These pull the long strands of kelp up toward the sunlit surface. The kelp forest provides food and a refuge from predators for a wealth of invertebrates such as sea urchins, starfish, crabs and snails as well as a diverse group of fish. Many open water sportfish spend their early life hiding in the nursery of the kelp forest. Harbor seals, California sea lions and sea otters forage for food among the kelp strands. Sea otters even use the kelp as an anchor. They roll up in the strands floating at the surface when they are ready for a nap.

Many kelp forest animals are well camouflaged like flounders hidden in the sand or mottled leopard sharks among the kelp. In contrast are brightly colored, red-orange fish, the garibaldi. Garibaldi are named after the Italian patriot Garibaldi, who united Italy. He and his followers wore bright red shirts. The bright color helps garibaldi advertise that they are defending territories from other garibaldi. Garibaldi are protected by law in California.

Did you know you eat kelp? Kelp is harvested by special boats and processed to yield a number of chemicals useful to people, especially the food additive algin. Algin makes food feel thicker and smoother and stabilizes ingredients. Among its many uses are dairy products like ice cream and chocolate milk, tooth paste, creams and lotions, rubber, textiles and paper products.

Garibaldi—Garibaldi belong to the damselfish family. Most damselfish are tropical. Tropical damselfish are frequently territorial as are these cold water damselfish.



Leopard Sharks—These small sharks are named for their mottled color pattern which helps them hide in the kelp. Despite their fierce name, they are harmless.

Kelp—Kelp grows in huge beds along the West Coast of the U.S. The kelp strands may stretch 100 feet or more from the rocky bottom to the sunlit surface waters where the fronds use the sun to do photosynthesis. Each giant seaweed is anchored by a holdfast which prevents the waves from washing it ashore.



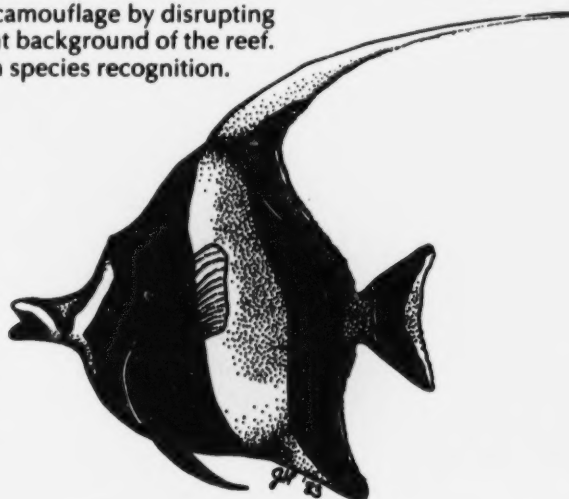
PACIFIC CORAL REEF

The wonderfully colorful and diverse world of the tropical Pacific coral reef is beautifully translated in this exhibit. Among coral branches, under ledges, in the warm sunlit waters above—fish are everywhere! Their brilliant colors and patterns are likened to those of butterflies.

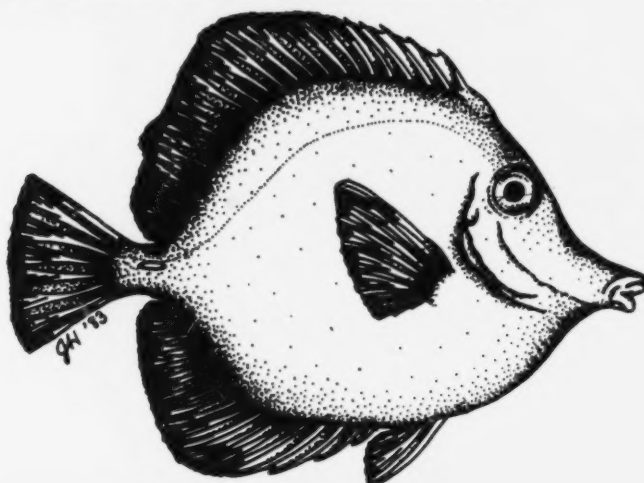
Why are the Pacific reef fish so colorful? No one can say for sure. Since the fish stay close to their hiding place in the reef, drab protective coloration is not necessary. Some color patterns do appear designed to disrupt the outline of the fish against the bright colors of the reef. Fish that appear absurdly bright in a tank may be quite well hidden against the corals. Other fish may use color to advertise for mates or help them establish territories. Color patterns may show age, with different colors for juveniles and adults, or may distinguish sexes or social status within a species.

Reefs are formed by the skeletons of corals, animals related to sea anemones. The corals in this exhibit are not real living coral animals. All Aquarium corals are fiberglass casts made from molds of real coral skeletons. Even the models show clearly that the corals are as wonderful and strange in form as any fish.

Moorish Idol—The long nipping mouth of the moorish idol is used to pick animals from crevices inside the reef. Their "abstract art" color pattern may serve as camouflage by disrupting the outline of the fish against the bright background of the reef. The color pattern may also be useful in species recognition.



Yellow Tang—These brightly colored fish depend on the algae they eat for the pigments that make them bright. The spine on either side of the tail marks them as members of the surgeonfish family.



Clown Triggerfish—Triggerfish get their name from the locking dorsal spine on their head. The clown trigger is rare and much sought for its beautiful colors arranged in such an odd pattern.

CHILDREN'S COVE

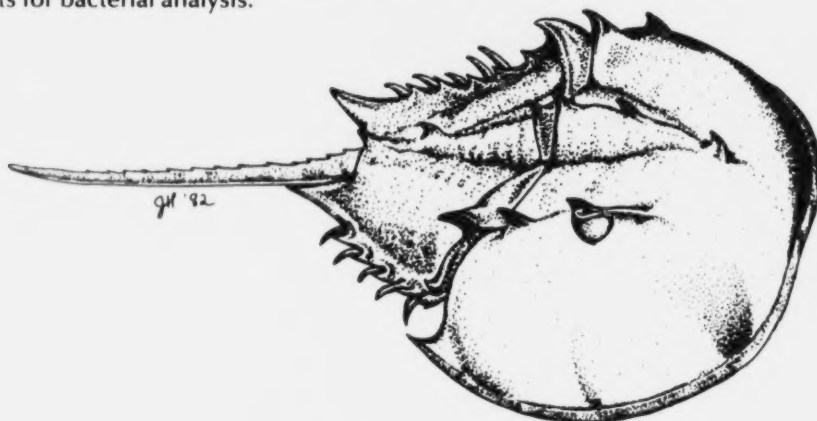
"Do Not Touch". "Keep Out". You will not find these signs posted here. We invite your students into the Children's Cove where, under the supervision of trained Exhibit Guides, they may hold a starfish or sea urchin or meet a horseshoe crab face to face. All kinds of common East Coast invertebrates live in the waters of the Cove.

Invertebrates are all animals which do not have a backbone. Ninety-five percent of the world's animals are invertebrates. Marine invertebrates are particularly interesting. Often we know them only from the shells or other remains we find on the beach. Here you can meet them alive! Unusual and exotic invertebrates which would not survive being handled are located in tanks in the rocky wall of the Cove.

Children tend to get excited in the Cove. Here are some important guidelines for their behavior.

- 1) Do not pick up animals without the help of a volunteer Exhibit Guide.
- 2) Many of these animals are fragile and must be treated gently, much like holding a delicate bird or insect.
- 3) Running or jumping is unsafe. Loud noises disturb other visitors.

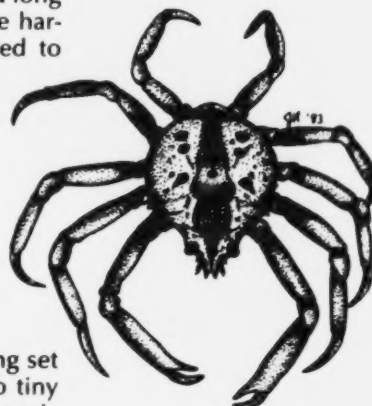
Horseshoe Crab—Horseshoe crabs are not really crabs. They are related to spiders and scorpions and have been around for 350 million years or more. They do not have much edible meat. Recently scientists have discovered that their blood can be used in medical tests for bacterial analysis.



Hermit Crab—The hermit crab makes use of an empty snail shell as a portable shelter from predators. When it grows and molts, the hermit crab must find a new shell to fit its increased size. It is vulnerable to predators when making the switch and does it as quickly as possible.

Sea Urchins—The spines surrounding the sea urchin serve to protect it. The spines work in conjunction with tiny tube feet to help the urchin move. The mouth is located on the urchin's underside.

Spider Crabs—Spider crabs get their name from their extra long legs. Alaskan king crabs are giant spider crabs which are harvested for food. Spider crabs are docile when compared to other crabs.



Whelk—When it reproduces, this predatory snail lays a long set of capsules, each filled with eggs. The eggs develop into tiny miniature whelks inside the case. A string of these cases is commonly called a mermaid's necklace by children who find it on the beach.

Sea Star—Like sea urchins, sea stars move on tube feet and have a mouth located on the underside. Although they appear slow, they are predators which specialize in eating clams, mussels and oysters. Strength and endurance are required, not speed.

MOVING ON

From the Children's Cove you will go to the South American Rain Forest. The entrance is lighted green and has a revolving door to prevent animals from leaving. Beyond there is an escalator which carries you upward to the Rain Forest.

Caution! Our Rain Forest is hot and very humid. You may want to avoid it if you have respiratory problems. It can be bypassed by going back around Level 4 past the Sea Cliffs to the top of the Atlantic Coral Reef.

If you have handicapped students, retrace your steps to the elevator next to the puffins in Sea Cliffs and go to Level 5. You will be going against the flow of traffic when you enter the Rain Forest from the elevator. An Exhibit Guide will assist you.



Richard Anderson

SOUTH AMERICAN RAIN FOREST— LEVEL 5

LEVEL FIVE: High above the Inner Harbor stands the Rain Forest. You will wander along a path beside waterfalls and pools (1 and 2), up onto observation platforms (3 and 4) and across a bridge into a darkened area (5) where small animals are displayed.



TROPICAL RAIN FORESTS

We commonly call tropical rain forests jungles. They are lush, evergreen forests found in three areas of the world. Over half of the rain forest is in South America with extensions into Central America. The Asian tropics contain a quarter of the world's rain forest with the remaining forest in Africa.

As the name implies, tropical rain forests are warm and very wet with more than 2 m. (6 ft.) of rain each year. Rain exceeds evaporation each month. The temperature never drops below freezing, and the sun is always overhead.

RAIN FOREST PLANTS

Plants grow all year, forming many levels of lush vegetation. Some rain forest trees grow very tall (50 m. or more) while others grow below them and require less sunlight. Each layer has lower light requirements. These layers form a solid canopy of leaves overhead, making the forest floor quite dark. Trees which are small and have high light requirements specialize in colonizing areas where a large tree has fallen, producing a clearing. The colonists grow very rapidly. They reproduce and disperse seeds before the larger trees grow above them and shade them out.

There are other ways to reach the light. Vines climb trees in their path to light. Small plants like bromeliads, orchids and philodendrons live above the forest floor attached to the trunks and branches of trees. They are not parasites. They only use the tree as a perch. Because these plants live upon other plants, they are called epiphytes (epi = on, phytes = plants).

Plants that are adapted to very low light live on the dark forest floor. Small palms and many other plants you might recognize as houseplants are common. Their tolerance for low light (2%–5% of sunlight) and need for warmth make them well adapted to life indoors.



Valerie Chase

RAIN FOREST ANIMALS

When people think of rain forest fish, they think of piranhas. Movies have made this South American fish famous as a vicious predator. The truth is less exciting. While they do have very sharp teeth which can bite chunks from larger prey, piranhas feed primarily on fish, fruits and seeds. During flood season they swim out into the forest in search of food.

The water in rain forest rivers is often murky and dark. Many groups of fish have developed "whiskers" which help them search the bottom for food. These whiskered fish are collectively called "catfish". Electric eels use electrical currents to sense prey in the dark water.

The forest provides many places to live. Animals that can climb, glide or fly are particularly well adapted to life among the many layers of the tree tops. Insects, spiders, frogs, lizards, vine snakes, sloths, monkeys and jungle cats climb high above the rain forest floor in search of food or shelter. The poison arrow frog even completes its entire life cycle high in the trees, in water trapped by the leaves of epiphytes called bromeliads. The sedentary sloth moves slowly from tree to tree, hanging upside down under a branch as it eats leaves. Many climbers are camouflaged. The sloth's fur becomes covered with green algae and blends in with the forest leaves.

Birds, bats and flying insects, particularly bees and butterflies, are highly successful in the rain forest. Hundreds of species of bats feed at night. Some search for flying insects while others eat fruit or lap nectar from flowers high above the forest floor. During the day, birds replace the bats and also feed on insects, fruits and nectar. A few birds are predators on larger animals such as lizards, snakes, birds and monkeys.

Many rain forest species are distasteful or poisonous. Animals which have this defense against predation are often brightly colored. This "warning coloration" acts as

advertising to predators to beware. In poison arrow frogs brilliant green, orange, yellow or red against a black background allows predators to easily learn their pattern and stay away. South American Indians smear poison from these frogs on their darts to paralyze small game.



RAIN FOREST DESTRUCTION

Rain forests have enormous numbers of kinds of plants and animals. They have very high species diversity. Rain forests occupy about 7% of the land of our planet, but have almost one half of all species.

Recent improvements in medical care and the use of pesticides in tropical countries have greatly reduced deaths from diseases and parasites. Consequently, human populations have increased very rapidly. Some countries have a population doubling time of as little as 18 years. As populations grow, the tropical forests are being cut for lumber and firewood and cleared for farming. The rate of destruction is alarming. Africa and Central America have already lost more than half of their forests. At the current rate of destruction, only a quarter of the world's tropical forests will remain in twenty years.

Tropical rain forests represent a tremendous reserve of genetic diversity. As the forests disappear, species are becoming extinct before they are even discovered. Many of these species could have become economically important species. Some species offered new genetic material for agricultural research. Others could have been sources of new drugs or chemicals. We already depend on rain forest species for important drugs, spices, beverages, chocolate and natural rubber. We will never know how many other useful species have become extinct.

Climatic patterns can be altered by removing vegetation. Scientists are concerned that the destruction of the Amazon Basin forests may alter global weather patterns. A reduction in rainfall is already observed in some areas of the tropics.

More than 200 species of fish in the Amazon feed on seeds and fruit from the forest. Cutting rain forest significantly reduces these fish populations. Local people depend on these fish as a source of protein. Where the forests have been cut, fishermen have gone out of business.

Forest destruction also affects people very directly. The native Indian tribes in the Amazon Basin are disappearing as the Transamazon Highway pushes onward.

OBSERVING IN THE AQUARIUM RAIN FOREST

When you visit the South American Rain Forest with your class, please remember—the animals are shy. Loud noises make them hide. Your students must look carefully, quietly and patiently to find the animals. Volunteer Exhibit Guides will help. Talk to them! Animals that some visitors might find scary such as snakes and frogs are not loose in the Rain Forest. They are caged at the end of the exhibit.

The plants in the Aquarium's Rain Forest are carefully chosen to produce a realistic environment. While the trees cannot be as tall as those in a real rain forest, there are still layers of vegetation. Look for vines and epiphytes like orchids and bromeliads on the trees. Many of the plants on the forest floor are ferns and palms which are adapted to low light.

Birds are abundant in the Aquarium's Rain Forest. You will surely see green Amazon parrots. A parrot's beak has many uses. It is powerful enough to crack hard seeds and nuts while its sharp edges cut fruit. Parrots also use their beak as a third claw as they climb in search of food.



Valerie Chase

The mot mot is harder to find because they perch quietly, waiting for insects. While perching, they swing their tails like pendulums or tilt them to one side. Their name comes from the sound of their call.

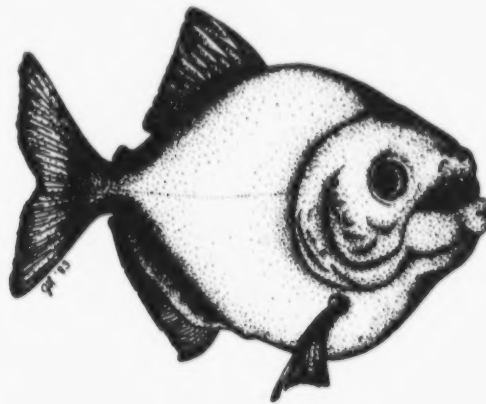
Tinamou are large, camouflaged birds which forage for seeds, fruits and insects on the ground. The male incubates a group of eggs which several females may have joined in laying. The tinamou walk around on the ledges above the forest or on the forest floor. You have to have a sharp eye to find them.

The brilliantly colored male cock-of-the-rock is easy to find. During mating, males join other cock-of-the-rock males on the forest floor in a communal display of leaping, feather whirring, bill snapping and fanning which attracts females. The dull brown camouflaged female builds a clay nest and raises her young alone.

Tropical freshwater fish are very popular as pets. The first pool in the Rain Forest contains whole schools of many different species of tetras, angelfish and others. The second pool is home for our piranha and catfish. Turtles and ducks occupy the third and fourth pools.

At the end of the walkway is a darkened area that displays small rain forest species or animals that cannot be free-living in the Rain Forest.

Piranha—Piranha probably evolved from their seed-eating relative, the pacu, which accounts for their strong jaws. You can tell the Aquarium's piranha by their red bellies and glittering gold scales.



Poison Arrow Frogs—These colorful little frogs use their bright colors to advertise to predators that they are poisonous.



Cock-of-the-rock—The male cock-of-the-rock has a crest which almost hides his bill. The female lacks the helmet crest and has dull, camouflaged brown feathers which will protect her from predation. She takes complete responsibility for raising the young.



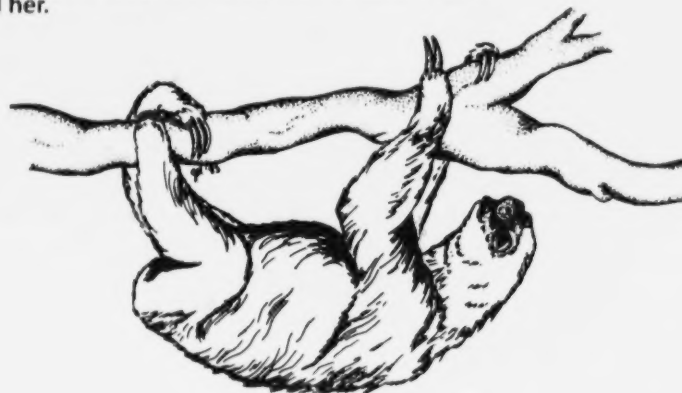
White-faced Whistling Ducks—These lovely ducks make a very un-ducklike loud whistle when excited.

Amazon Parrots—Parrots are good mimics. They can learn to repeat both words and sentences. Small green parrots of the genus *Amazona* are popular as pets, but keeping a parrot requires daily work. Most of the Aquarium's parrots were donated by people who tired of caring for them. Much of the trade in parrots is not legal, and many species are threatened with extinction. Captive breeding of pet parrots would relieve much of the problem.



Acouchi—These small brown rodents like to hide extra food. They are shy and will dart in and out of their protective burrow. The acouchi are breeding very successfully at the Aquarium. Their offspring are sold to zoos.

Two-toed Sloth—Two-toed sloths are more active than the exceptionally slow moving three-toed sloth. Two-toed sloths are easier to keep in captivity because they eat a wide range of food. Because she is active, the Aquarium's sloth "escapes" from her perch and travels through trees periodically. Sometimes it takes several days to find her.



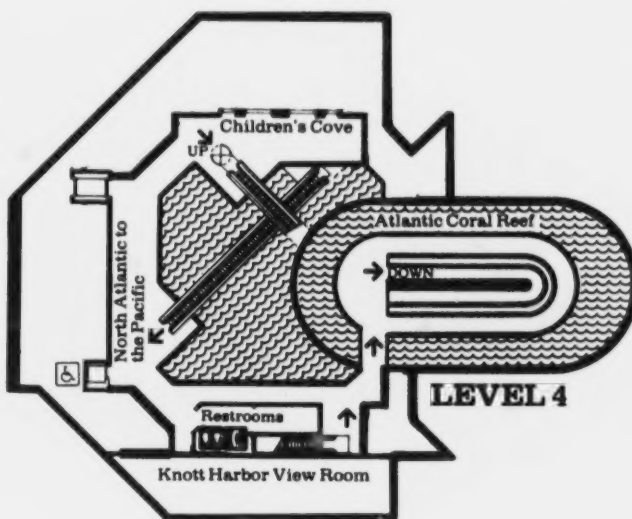
MOVING ON

At the end of the Rain Forest, you go through a revolving door and down an escalator. Pictures above and sound will take you from the Rain Forest to a tropical beach and then into the sea where you will encounter the Atlantic Coral Reef. At the bottom of the escalator go straight ahead to the Coral Reef or make a left turn for a detour to the Level 4 restroom and drinking fountain.

Handicapped students will find the elevator to the right at the end of a hall in the dark area of the Rain Forest. Return to Level 4 and go straight ahead to reach the top of the Atlantic Coral Reef.

ATLANTIC CORAL REEF— LEVEL 4 AND 3

LEVEL FOUR AND THREE: The Atlantic Coral Reef can be seen from a number of locations in the Aquarium. The best view is inside the ring tank, but two outside windows are located on Level 3, at the beginning and the end of the Adaptations gallery. A map showing locations of Atlantic coral reefs is at the top of the exhibit. The restrooms are accessible before entering the Reef.



CORAL REEFS

Coral reefs are special places. People learn to SCUBA dive and travel thousands of miles during their vacations to visit these amazing underwater worlds. In the Aquarium your students can experience this world for themselves as they walk down into the 13 foot deep, 325,000 gallon Atlantic Coral Reef.

Corals

Coral reefs grow in the warm, shallow, clear seas of the Western Atlantic, Western Pacific and Indian Oceans. The reef forms from the slowly accumulated limestone skeletons of animals called stony corals. Corals are relatives of sea anemones. At night their extended fleshy bodies look like small anemones as they catch tiny animals called zooplankton using the stinging cells in their tentacles. During the day stony corals hide, withdrawn inside their skeleton.

Coral reefs are found only in clear, shallow water. Stony corals are animals, but they require light to grow. We know plants require light, but why should animals need it? Inside the tissue of stony corals are incredible numbers of tiny, single-celled plants (algae). These algae, called zooxanthellae, make up as much as half of the living material in a coral. They provide food to the coral. In turn the zooxanthellae are bathed in essential nutrients like nitrate and phosphate which are waste products of coral's metabolism. Corals can survive without the algae. If corals are kept in the dark they will even

purge themselves of the algae. However, corals cannot build a stony skeleton without these photosynthetic zooxanthellae. Consequently, the stony reef-building corals are found only where light penetrates in shallow (30m.), clear seas. Sediments or cloudy water will kill corals. This interdependence of coral and algae is an example of mutual benefit from a symbiotic relationship.



Valerie Chase

The Aquarium does not have living corals because it cannot reproduce full sunlight. The Aquarium's Reef is made from fiberglass which is molded from real coral skeletons. These "corals" are very accurate models of the real corals. Also, there are no real invertebrates in the Reef since the fish would eat them. There are models of typical Caribbean sponges, sea whips and fans, and long-spined sea urchins.

FISH AND INVERTEBRATES

Coral reefs are the home of an incredible diversity of animals and algae. Whenever the stony coral dies, seaweeds and invertebrates such as sponges settle and grow in profusion. Other invertebrates including shrimp, crabs, sea anemones, and sea urchins live in cracks and caves among the corals. Fish swarm into and around the reef. The reef is both a source of food and a refuge from the larger predators that roam the open water around the reef. Plant-eating (herbivorous) fish browse on the algae that grows on dead coral. In one group of herbivores, the damselfishes, each fish stakes out its own homestead and grows a crop of seaweed. The fish weeds out undesirable algal species and aggressively defends its feeding territory against damselfish and other herbivorous fish.

Parrotfish also consume plant material. They eat both algae and the zooxanthellae growing in coral. The bony beak that gives them their name is used to bite the coral. Under water the sound of parrotfish feeding on coral is quite loud because they break the skeleton. The coral is ground up in a bony mill in the parrotfish's throat. The crushed coral skeleton is excreted as sand, and the plant and animal material digested.

Many reef fish depend on invertebrates for food. They often have mouths extending beyond the rest of their faces. Extended mouths help them pick invertebrates from inside crevices in the reef. Angelfish, butterflyfish and filefish are among the pickers. Other invertebrate feeders include the grunts who search for invertebrates in grass beds near the reef at night. They have lower mouths. Grunts get their name from the noise they make when disturbed.

Among the coral reef fish that feed on other fish smaller than themselves are snappers, pompano, lookdowns, bonefish, and, more impressive, tarpon. These fish swim in

the open water near the reef. Some are constant swimmers while others lurk quietly waiting for an unwary fish to stray too near. The "lurkers" have broad, flat tails that deliver short bursts of tremendous power. The constant swimmers have forked tails which give efficient continuous power.

Cleaning is a particularly interesting behavior of some reef fish. A smaller fish will eat external parasites off of larger fish which pose in odd positions to solicit this cleaning. Often a line of fish wait to be cleaned. The small fish gets a meal, and the large fish gets rid of pests. Both benefit from this mutualistic relationship.

Stingrays and nurse sharks are the most common cartilaginous fish in the Caribbean. Nurse sharks lurk under ledges during the day, and come out at night to feed. Bonnet-head sharks may swim in the open water nearby. They are frequently mistaken for hammerheads which have a much wider head.

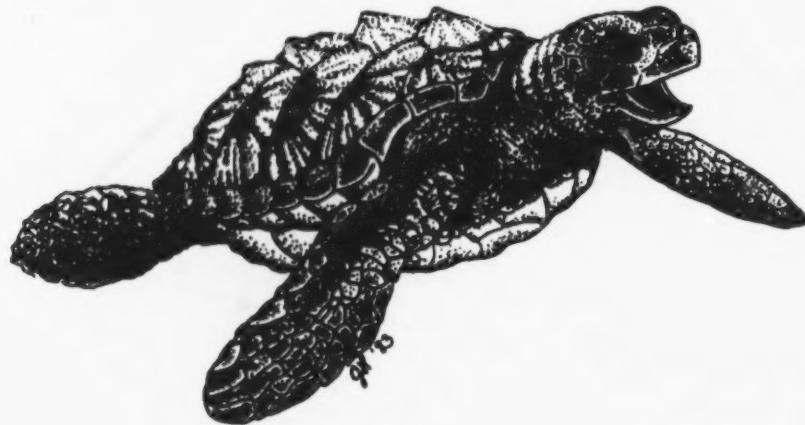
Sea turtles are endangered species but divers are still sometimes lucky enough to encounter a hawksbill turtle in a reef. The hawksbill turtle is killed for its tortoise shell. Egg hunting and lack of nesting sites due to beach destruction threaten all of the world's sea turtles. Sea turtles are protected by law in the United States as endangered species.

THE AQUARIUM'S REEF

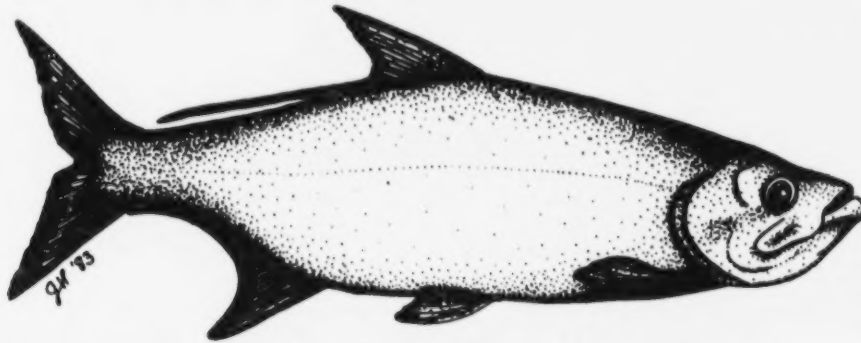
The Atlantic Coral Reef is always fascinating. Your class can see schooling, compare swimming modes, find porkfish cleaning parasites from larger fish and search for territorial damselfish.

Three times each day a diver will feed the fish. They are fed by hand to ensure that each gets the correct food and is not crowded out by larger fish. The plant-eaters get broccoli, lettuce and trout chow. Parrotfish get their trout chow imbedded in plaster of Paris chunks which simulate coral. Those fish which specialize on invertebrates are fed brine shrimp, krill in several sizes, shrimp, clams and squid. Whole and cut-up fish round out the menu. Feeding times are posted at the Information Desk in the Lobby.

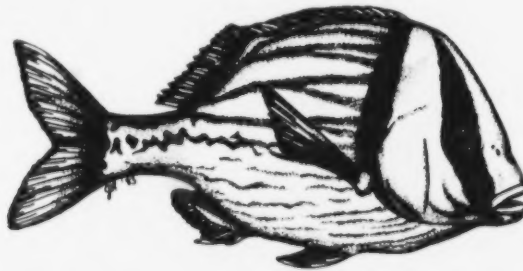
Hawksbill Turtle—Hawksbill turtles rest by wedging themselves into a coral reef for a nap. Like all turtles they must occasionally surface to breathe, but they can stay under for many hours.



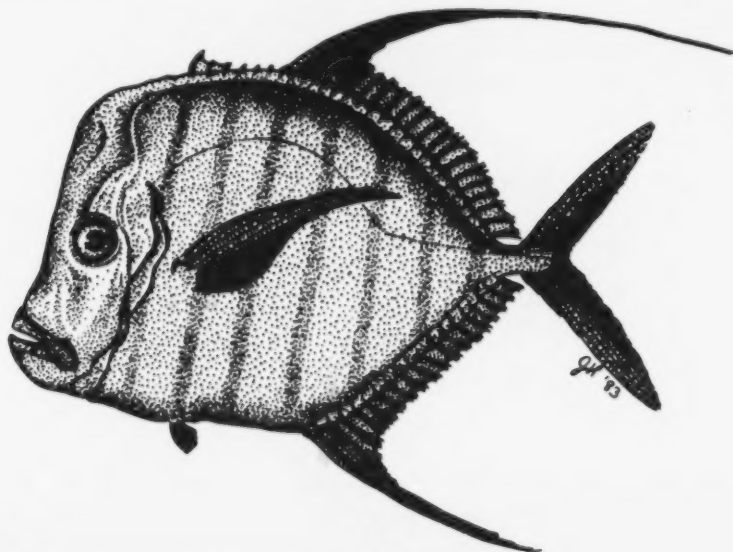
Tarpon—This large predator feeds at the surface of the water. The position of its mouth indicates it is a surface feeder. The Aquarium's tarpon eats other fish and ignores food offered by the divers.



Porkfish—Porkfish are very popular with other fish in the coral reef because they eat the parasites living on other fish. In the wild only juvenile porkfish are cleaners, but in the Aquarium's reef the adults also clean parasites.



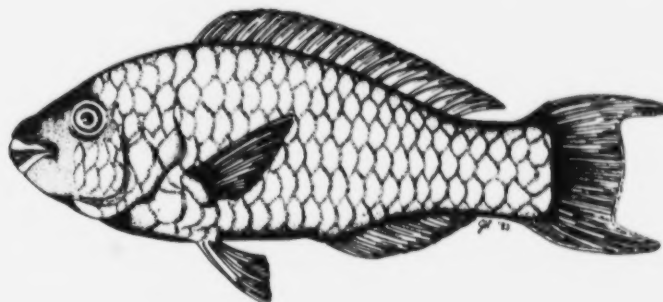
Lookdown—These tall thin fish with "pushed in" faces swim continuously, schooling in the surface waters. They never rest. Their narrow forked tail is characteristic of constant swimmers.



Damselfish—These small brown fish were bright yellow when they were juveniles. They change color as they mature. Despite their size, damselfish aggressively defend their feeding territory.

ries and will attack much larger fish and even divers if they invade the damsels' territory. The Aquarium divers complain of nips and pulled hairs when they swim past the damselfish.

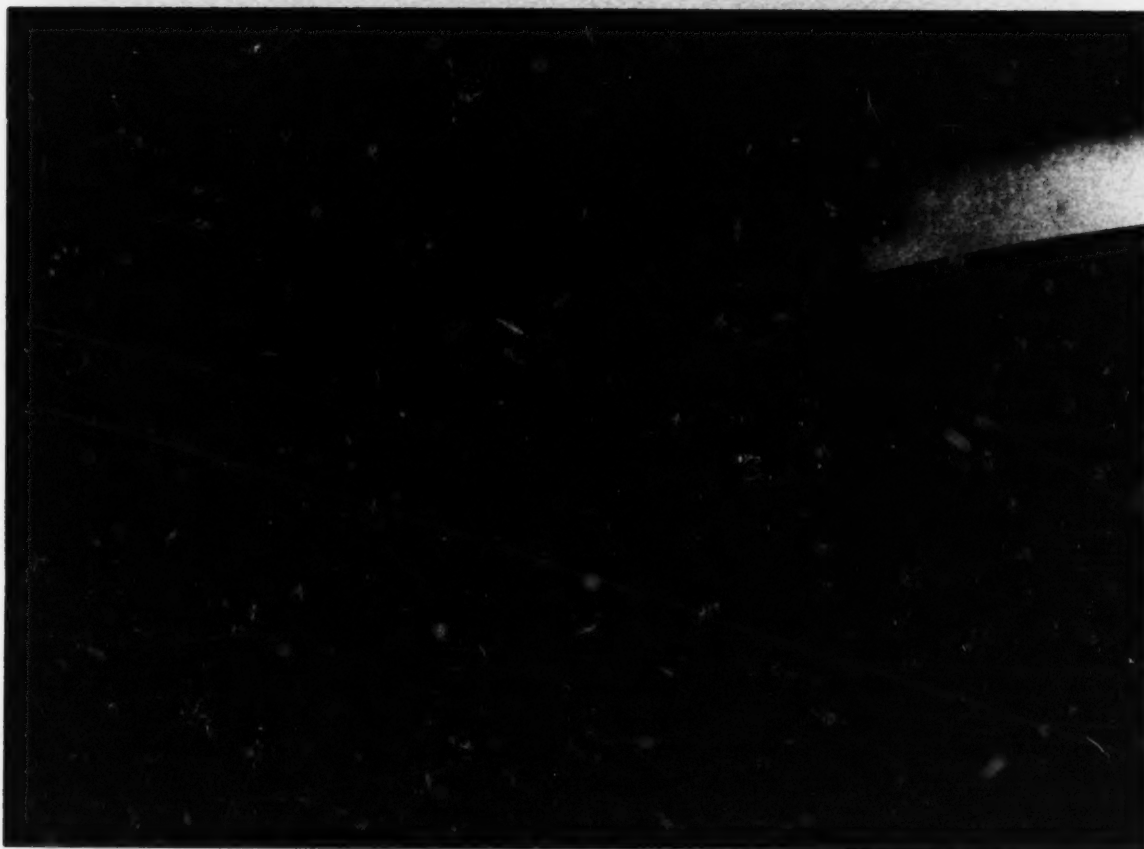
Parrotfish—During their lifetime, parrotfish change colors several times. The color phases distinguish juveniles and adults. The last change signals a sex change from female to male. These terminal phase males are the largest and most brilliantly colored individuals.



MOVING ON

Please continue slowly down the ramp to the Open Ocean exhibit. Do not allow your student to run on the ramps. Running is disruptive and dangerous.

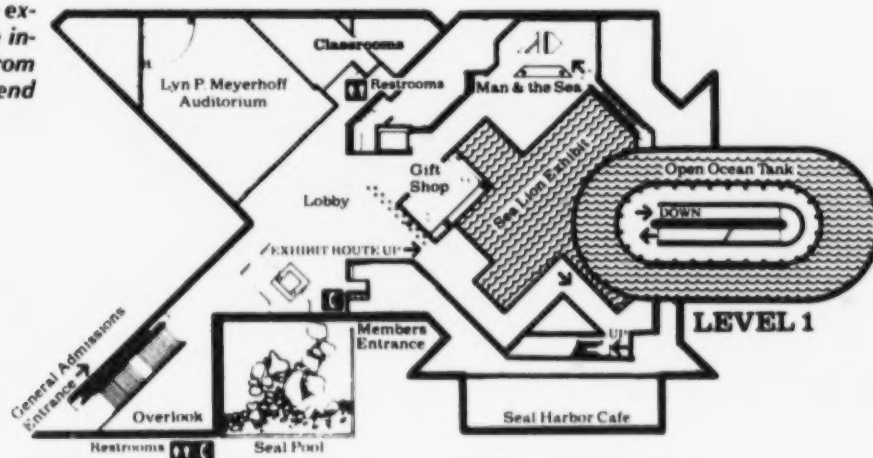
If you have handicapped students, continue descending cautiously. Wheelchair brakes may be applied.



Gary Baese

OPEN OCEAN—LEVEL 1

LEVEL ONE: The Open Ocean exhibit may be viewed from the inside of the ring tank and from Level 1 as you begin and end your tour.



Big sharks, little sharks, rays, schools of bony fish, a huge grouper—the Open Ocean exhibit displays them all. Sharks are some of the most popular animals, especially with younger children. Sharks are fascinating. We hope you will help your children learn the truth about sharks rather than base their opinions on movies like “Jaws”.

Sharks and their relatives, the skates and rays, are fish, but they differ from most fish in that their skeleton is made of tough, flexible cartilage, rather than bone. Cartilage is the precursor of bone in the embryonic development of vertebrates. As the animal matures, bone replaces cartilage. In humans cartilage is retained in our nose and ear lobes as well as in some joints like the knee. In sharks and rays the adult skeleton is cartilage. They belong to the major class Chondrichthyes which means cartilaginous (chondr-) fish (ichthyes). Bony fish are Osteichthyes (ostei-bones).

Both sharks and modern bony fishes evolved from early bony fishes. They were abundant in the seas 350 million years ago. In terms of species numbers, the bony fish are most successful. There are now about 20,000 species of bony fish and about 350 species of sharks and their relatives. Sharks differ from bony fish in a number of ways which are interesting to consider.

HABITAT

Sharks and rays are primarily marine animals although a few may be found in fresh water. Bony fish have successfully occupied both fresh and saltwater habitats.

SCALES

Sharks and rays lack the typical scales usually found on bony fish. They are covered with a thick, tough hide in which small spines are usually imbedded. These spines are much like teeth and are covered with enamel. Their sharp points are aimed toward the tail, making sharkskin feel very rough when rubbed the wrong way. They are called dermal denticles.

GILLS

Sharks and bony fish both get oxygen from water with gills which are feathery, blood-rich structures arranged in layers inside their heads.

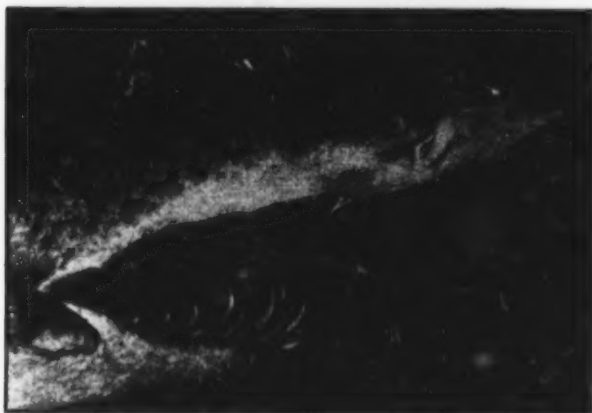
Sharks have separate openings called gill slits for each gill, typically five on each side. Bony fish have one large opening covered by a flap called the operculum. In both the path of water is into the mouth, over the gills and out the opening behind the head. In case of bottom-dwelling rays which sit with their mouth buried in sand or mud, water comes in an opening called the spiracle located just behind their eye. Among all fishes, some species must swim with their mouth open to force water over their gills while others can pump water over their gills, using muscles. Those that can pump water may rest on the bottom or in caves. Compare the Aquarium's sharks and decide which can pump and which must swim.

BUOYANCY

Sharks lack the air bladder which helps bony fish adjust their buoyancy. Consequently, when they stop swimming, sharks tend to sink to the bottom. Their oily liver may add some buoyancy. Which shark species lies on the bottom of the Open Ocean Tank most of the time?

FEEDING

Sharks that feed on fleshy prey have sharp, serrated teeth arranged in rows along the margin of their jaw which are constantly replaced as they wear or break. Some sharks



Valerie Chase

may get a new set of teeth every two weeks. Look carefully at the teeth in our sand tiger sharks. Other sharks and most rays have jaws with hard plates which are designed to crush shellfish. Whale sharks, the largest fish of all, filter tiny animals, zooplankton, from the sea with gill structures.

REPRODUCTION

Reproduction is very different in the two groups of fishes. The female bony fish generally lays many small eggs which are fertilized externally in the water by the male. Occasionally the fertilized eggs are then protected or carried in a pouch or mouth.

Sharks and rays have internal fertilization. Sperm is transferred with the aid of the male's claspers which are extensions of the paired fins on the lower rear part of the shark (pelvic fins). The female shark makes a few large eggs containing considerable stored food (yolk). In most species, including rays, the female retains these fertilized eggs inside her body where they develop safe from predation. She bears live young when the yolk is used up. In other species, including skates, the female surrounds each fertilized egg with a tough, leathery egg case and lays them in vegetation. They may develop for as long as a year hidden from predators. People often find empty skate egg cases (mermaid's purses) when beachcombing.

The mother shark does not care for her young. When they are born or hatch, they are on their own. Adult sharks even eat them. Indeed, large sharks frequently try to eat smaller ones.

SENSES

Sharks and bony fish have reasonably good vision, but light is often limited in the sea. They use many other senses in addition to sight to help them find prey and avoid predators.

Sharks and bony fish both use their sense of smell and of "hearing" to help them find prey. Their sense of smell is located in pouches called nares on either side above their mouth. They do not have nostrils which are structures which go all the way through into the mouth.

Sharks and bony fish hear with a system that combines "hearing" with general sensitivity to vibration over much of their body. They have an inner ear for hearing which also helps with balance, and a system of vibration-sensitive areas called the lateral line system running down each side.

Sharks and some bony fish are sensitive to electrical fields. They can detect prey or approaching predators with this sense.

Sharks and bony fish that feed on bottom-dwelling invertebrates often have sensitive whiskers called barbels which help them locate animals by touch. Nurse sharks and catfish both have barbels.

ASSOCIATIONS

Some bony fish form a close association with sharks and are found swimming with them. Cobia and pilotfish swim freely alongside sharks while remoras and their relatives, the

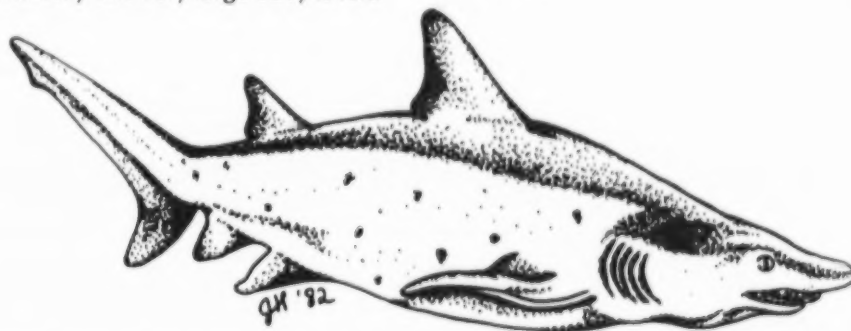
sharksuckers, have a suction disk on top of their head which they use to hitch a ride on a shark. These bony fish may also be free-living or may attach to other animals like sea turtles, whales or billfish. They may feed on left-over scraps (sharks are messy eaters) or external parasites from their hosts.

MOVING ON

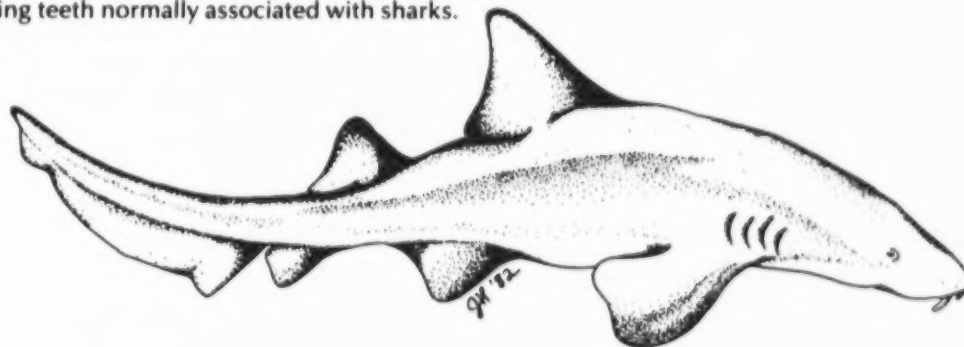
From the Open Ocean exhibit you will continue down the ramp to the marine mammal underwater viewing area. Return to Level 1 and the Lobby by the way of the Man and the Sea exhibit and our gift shop, Puffin Place, by taking the up escalator to your right.

Handicapped persons may return to the Lobby by going through the emergency exit door to the left and following the blue line to the elevator. You may also leave the building at this time by selecting G on the elevator.

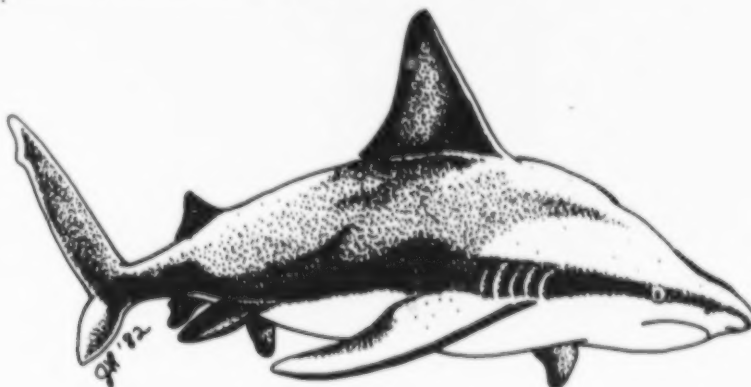
Sand Tiger Shark—Sand tiger sharks are common in the Western Atlantic. The Aquarium caught the largest off the coast of Delaware. Sand tigers are bottom-feeders and eat crustaceans, fish, squid and octopus. Sharks sink when they stop swimming. Sand tigers swim slowly and may swallow air to help them keep afloat. As sand tiger babies develop inside the female, they eat each other until only one very large baby is left.



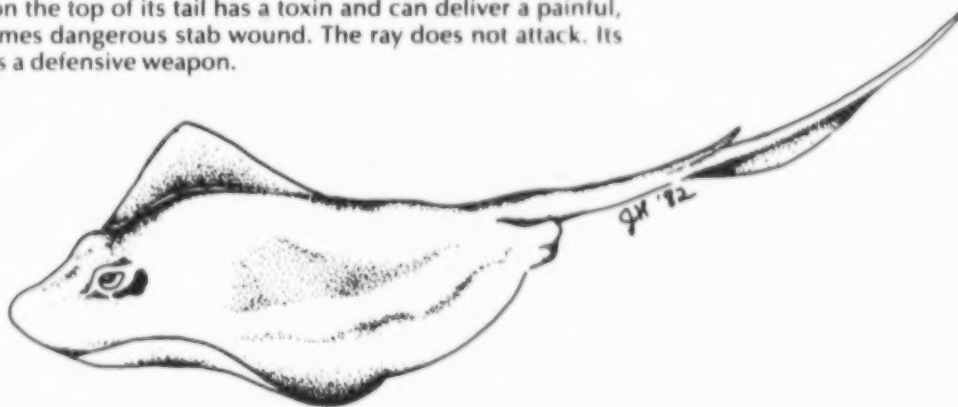
Nurse Shark—Common along tropical and subtropical Atlantic coastlines, these large sluggish sharks rest by day under ledges, singly or in groups. They forage for bottom-dwelling animals at night. Their sensitive "whiskers" or barbels help them find food. They will eat most invertebrates and small fish. Their name may derive from the fact that they suck food into their mouth. Nurse sharks have bony plates to crush prey rather than sharp, meat-cutting teeth normally associated with sharks.



Brown Sharks—Known as sandbar or brown sharks, these sleek, fast swimmers are abundant in the coastal waters off Delaware. Compare the size of their second dorsal fin to that of the sand tiger and nurse sharks. The smaller the second dorsal, the faster the shark species.



Stingray—The southern stingray is a graceful bottom feeder. The spine on the top of its tail has a toxin and can deliver a painful, sometimes dangerous stab wound. The ray does not attack. Its spine is a defensive weapon.





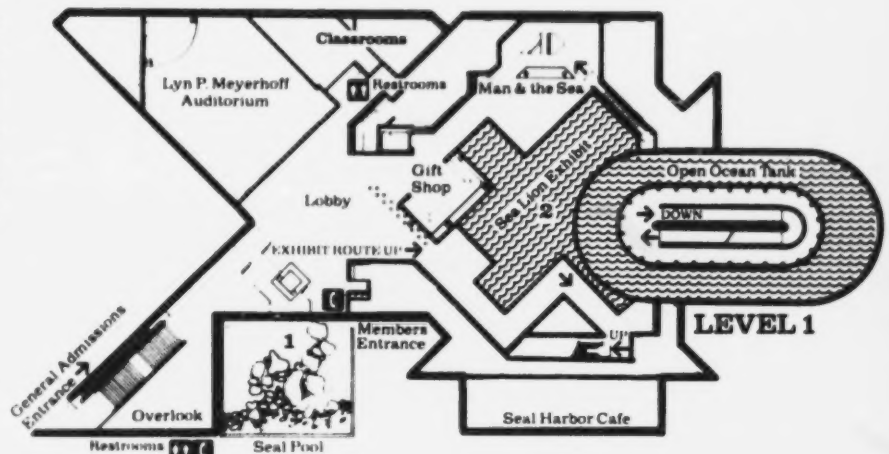
Richard Anderson

11 C

54

MARINE MAMMALS— PIER AND LEVEL 1

PIER AND LEVEL ONE: The Aquarium displays marine mammals in two locations. Seals live in an outdoor pool on the pier (1) while sea lions may be found in the pool in our central space (2). A whale and a porpoise skeleton hang in the central space over the sea lion pool.



"Smiling" dolphins, mischievous sea lions, mysterious whales, playful sea otters—marine mammals capture our imagination. We endow them with all sorts of human traits and ascribe thoughts and ideas to their behavior that are of our own making. We seldom allow them to just be animals, our mammalian cousins that have adapted to life at sea. Like all mammals they breathe air, have hair, bear live young which they nurse with milk from mammary glands and maintain a constant, warm internal body temperature. The marine mammals include manatees and sea cows; sea otters; the pinnipeds—seals, sea lions and walrus; and the cetaceans—whales, dolphins and porpoises. Each group has unique solutions to the problems of living in the sea.

GETTING AIR

Although all must surface to breathe, some mammals can dive deeper and stay down longer than others. Weddell's seals can dive under Antarctic ice for over an hour. Sperm whales dive up to an hour to depths of 1000 m. or more. Dolphins, sea lions, sea otters and manatees generally stay closer to the surface. During diving a reflex response causes the heart rate to slow and shuts off blood flow to the muscles, saving oxygen-rich blood for the brain. While under, marine mammals may build up an "oxygen debt" by producing energy without using oxygen. When they come up, they remain at the surface for a bit to repay this debt.

REPRODUCTION

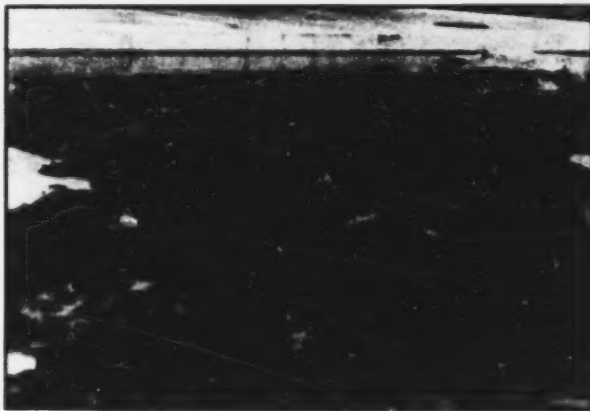
Marine mammals normally have one offspring per year or every other year. When they bear young, seals, sea lions and walrus haul out on rocky beaches or ice flows. The babies remain on land for a month or more after they are born. In the crowded colonies the young are frequently crushed by the adults, but are probably safer from natural predators than in the water. They also have an easier time maintaining their internal body temperature since air does not conduct heat away as fast as water.

Dolphins, whales, manatees and sea otters bear young in the water. While dolphins and manatees stay in warmer waters, many whales migrate from cold feeding grounds to warmer seas so that their offspring can start life in warm water.

The sea otter is born with a dense coat of fur which traps air and insulates it in cold water. It may sit high and dry on its mother's chest while she floats on her back, but must remain behind, floating alone when she dives in search of food.

INSULATION

In order to maintain a warm internal temperature while living in cooler water, most marine animals have a heavy insulating layer of fat below the skin and eat great amounts of food for energy. Sea otters are an exception. Sea otters depend on air trapped by their fur coat for insulation. Otters groom their fur constantly to preserve this trapped air. They were hunted so intensively for this lovely fur that the southern sea otter was thought to be extinct and has only recently reappeared off the coast of central California.



Valerie Chase

SWIMMING

Marine mammals use different forms of locomotion. Dolphins, porpoises and whales have lost their hind limbs and have tails that are horizontally flattened. As their tail moves up and down, they are pushed through the water. Their flippers serve for steering and stabilization.

Seals have much reduced front and hind limbs which are unable to support their weight. They swim by alternately paddling side to side with their huge webbed hind feet. Again, front flippers serve for steering and stabilization with occasional paddling. On land, seals scoot along on their bellies with a bit of help from the front flippers. Claws on the front flippers help gain purchase when moving across ice.

On land, sea lions are much more mobile than seals. They can support their weight on long front and hind flippers and move quite rapidly. In water sea lions paddle with front flippers and steer with the hind ones. They are very fast and able to change directions instantly. In addition to the difference in use of flippers seals can be distinguished from sea lions by the presence of ear lobes. Seals have a hole for their ear and sea lions have ear lobes around the hole. Consequently, sea lions are also called eared seals.

Sea otters have legs with webbed paws and can move on land. While paddling on their back with their hind limbs, sea otters can groom themselves and handle food with their front paws. They may even use stones as tools in opening tough invertebrates like sea urchins.

FEEDING

Marine mammals utilize a wide variety of foods. Manatees and sea cows are the only vegetarians. Among those that feed on invertebrates are walrus that locate clams with their stiff whiskers, beluga whales and sea otters. Fish or squid is the usual diet of the toothed whales, including dolphins, porpoises, pilot whales and sperm whale, and of seals and sea lions. One toothed whale, the orca or killer whale, catches large fish and small marine mammals.

Baleen whales are the largest marine animals, yet they feed on small planktonic invertebrates including krill and, in some cases, small fish. They strain these tiny animals from the sea with rows of fringed comb-like baleen which grow down from the roof of their mouth. The blue whale, the largest animal that ever lived, is a baleen whale.

SOUND

Marine mammals live in a dark, murky world. Many have evolved systems of echolocation or sonar to find food or locate obstacles. Dolphins and porpoises are particularly adept at echolocation. Some seals may have a crude form of sonar. In the darkness, sound is also used for communication with other members of the same species, especially among the toothed and baleen whales (cetaceans). The songs of humpback whales, the low-pitched boom of blue whales, the chirps and trills of the beluga and the whistles of dolphins are all means of cetacean communication. Low-pitched sounds may travel hundreds of miles in water.

Sounds are also used for communication among seals, sea lions, walrus and otters. Many marine mammals have complicated social lives which require social communication. Sound is often used as it is in birds—for the establishment of breeding territories, mate location, mate attraction and identification of offspring. One of the loudest sounds is the hoarse barking of the sea lions. It can be deafening in a haul-out area.

PROTECTION

Many species of marine mammals are threatened with extinction, largely due to hunting. In the United States they are protected by a federal law, the Marine Mammal Protection Act. With protection, coastal species like elephant seals and sea otters have increased in

numbers. The large whales which range the world's oceans will not be safe unless all nations agree to protect them.

AQUARIUM MARINE MAMMALS

The whale skeleton hanging over the sea lion pool is from a fin whale. It was killed by whalers off the New England coast in 1880. The skeleton was prepared for museum display at that time. When you look at it, mentally add 3m. (10 ft.). Ten vertebrae were removed to make it fit inside the Aquarium.

The Aquarium displays California sea lions. They were stranded animals that were rescued and nursed back to health.

Most of the seals are harbor seals, but there is also a big grey seal who is easily recognized by his long nose. Seals are shy and dislike loud noises. Noisy children cause them to take refuge underwater. Items thrown into their pool may be lethal if eaten. Coins are especially dangerous.

Check at the Information Desk for seal and sea lion feeding times. Feeding is a delight to watch and includes a demonstration/talk about the animals and their behavior.

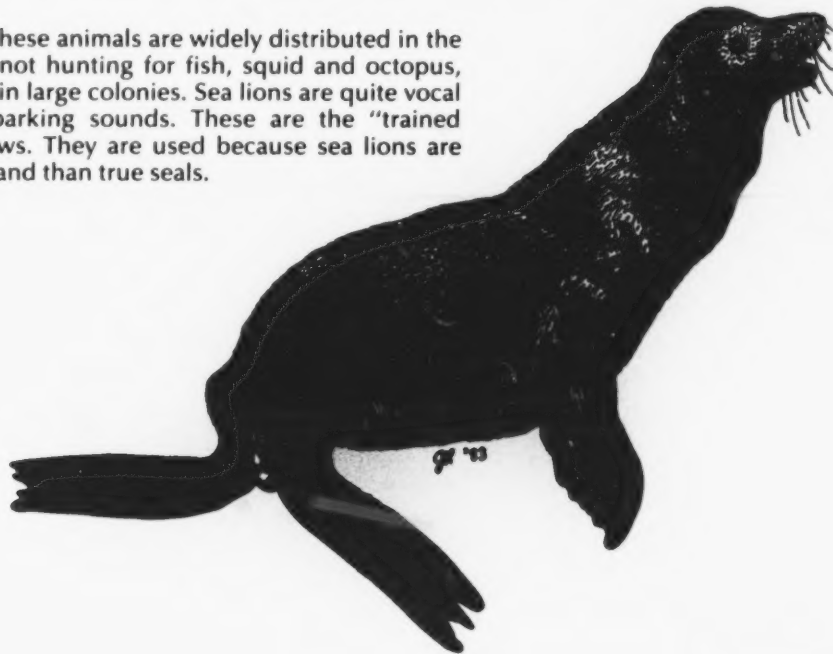
Harbor Seal—These seals live along coastlines in the northern Atlantic and Pacific. They often wander into populated areas, hence, their name. They pursue fish, squid or bottom dwelling invertebrates in shallow waters. On warm days harbor seals like to haul out on a rock for a nap. In captivity harbor seals may live thirty years or more.



Gray Seal—Gray seals live at sea and breed on rocky coastlines on both sides of the North Atlantic. Males may grow to 1,000 lbs. (300 kg.). They eat primarily fish. The long nose leads some people to call them horse seals. Aquarium visitors frequently confuse them with elephant seals.



California Sea Lion—These animals are widely distributed in the north Pacific. When not hunting for fish, squid and octopus, they collect on rocks in large colonies. Sea lions are quite vocal and produce loud barking sounds. These are the "trained seals" of animal shows. They are used because sea lions are much more agile on land than true seals.





Gary Baese

These are activities which have been written by Aquarium staff and Baltimore County Public school teachers. They are not divided by age level since children's abilities vary. It is left to you to decide how they best fit your curriculum.

If you are planning to do an activity at the Aquarium, either use one with the small 3" x 5" cards or provide a clipboard with the pencil tied on. Worksheets cannot be placed against the graphics or the exhibit front, and pencils or pens dropped in exhibits endanger the animals' health.

If you have scheduled a special program given by an Education staff person, you will receive additional pre- and post-visit activities and materials with your contract that relate directly to the program.

CONTENTS IN ORDER

Chaparone's Guide to the Aquarium

Aquarium Dictionary

Aquarium Geography

Rain Forests of the World

Fish Parts

Make-a-Fish

Visit from the Deep

Animal Movement

Opposites

Fish Body Shapes

Sea Lion Observations

Seal Observations

Seal and Sea Lion Review

Atlantic Coral Reef

Shark Observation Sheet

Aquarium Detectives

Demonstrating Water Cycle

Maryland: Mountains to the Sea

The Water Cycle Crossword

Who Am I?

Animals You Saw at the Aquarium

Fishy Tales

Sardines

Rain Forest Word Search

Feeding Word Search

Aquarium Puzzle

Aquarium Crossword Puzzle

Career Awareness Activity



Richard Anderson

CHAPERONE'S GUIDE TO THE NATIONAL AQUARIUM IN BALTIMORE

When we are ready to leave the Aquarium, we will meet at:

Time: _____

Location: _____

Special Instructions:

You have the opportunity to make this visit an educational experience. Please consider the following:

Rules:

Your teacher signed a contract agreeing that your students will abide by the following rules:

- Students will remain with their chaperones at all times, including the Gift Shop and Lobby.
- Neither food nor drink can be brought into the Aquarium.
- Fire regulations prohibit smoking anywhere, including the restrooms.
- Running, pushing or shouting scares the animals and ruins other visitors' trip.

Schools violating these rules may be denied admission in the future.

Important Locations:

- Restrooms are in the lobby to the right of the auditorium and on level 4 to the left of the Sea Cliffs exhibit (puffins) and outside next to the Seal Pool.
- Elevators for the use of handicapped students are located at the Seal Pool/Security entrance at wharf-level and on each floor and are clearly marked with the handicapped sign. The unmarked elevator is a freight elevator and will not come to call.
- Information is available from Exhibit Guides located around the building and at the Information Desk in the lobby.

Cameras:

You may take pictures in the Aquarium. Flash is acceptable, except in exhibits of deep sea fish. These are marked "No Flash Please".

Helping Your Students to Learn:

Engaging students in conversation about what they see will help them focus their thoughts and observe more carefully. Consider questions like these as a way to initiate dialogue:

- What do you like best about this exhibit? Why?
- Why do you think this (exhibit/animal) was included?
- What does this exhibit make you feel like?
- Why do you think this animal is (behaving/colored/swimming) this way?
- Can you identify this animal from the identification labels? Where does it live?
- Was the Aquarium what you expected? Why?
- Do you think the Aquarium will change the way people think about fish?
- What are the benefits of having the Aquarium in Baltimore?

AQUARIUM DICTIONARY

Students may use their Aquarium visit as the focus of activities involving vocabulary and dictionary usage.

Here is a list of words which your students may hear or see during their visit.

adaptation	coral reef	omnivorous
behavior	feeding	parasite
breeding	filtering	rain forest
camouflage	habitat	schooling
carnivore	herbivorous	symbiotic
cartilage	invertebrate	territory
cleaning	occupying	vertebrate

You may add to this list if you have signed up for an auditorium, classroom or gallery program. The pre-visit materials you receive with your contract will help you choose additional words.

1. Make flash cards with the words on one set and the definitions on another set and have your students practice matching them.
2. For the more experienced students:
Have your students compile a list of words which are unique to the National Aquarium in Baltimore. You might let them use the exhibit guide you received at your orientation session as a source of ideas. Have them use the dictionary to find the definitions of these words and alphabetize them.
3. For less experienced students:
Have a list of Aquarium-related words. Assist the students in researching the definitions or assign a mother-helper to work with the students. They might illustrate the definitions and arrange them in alphabetical order.

AQUARIUM GEOGRAPHY

Before:

Give each student or each group of students the list of Aquarium Exhibits shown here. Explain that they are going to discover *where* each of these exhibits really occurs in the world and *what* lives there. Use graphics and exhibit guides as sources of information.

After:

Distribute maps of the world (available in pads from Carolina Biological Supply) to each student or each group. Find the real location of each habitat on the map.

AQUARIUM GEOGRAPHY

Name _____

<i>Exhibit or Habitat</i>	<i>Location</i>	<i>Kinds of Animals Displayed</i>
Sea Cliffs		
Kelp Forest		
Pacific Reef		
Children's Cove		
Rain Forest		
Atlantic Coral Reef		
Open Ocean		

RAIN FORESTS OF THE WORLD

1. Have the students locate and shade in or color the locations of the rain forests of the world on a map of the world.
2. Draw a cross section of a rain forest on a bulletin board. (You may reproduce this drawing or make a thermal transparency for an overhead projector and draw the image on craft paper on the wall.)
3. When your class visits the Aquarium, have each student select an animal or plant in the rain forest. Give them pencils and index cards. They should record information about the animal or plant on one side and make a rough sketch on the reverse side. Identification labels are in the railings. Also, the volunteer Exhibit Guides are a great help in finding and identifying plants and animals.
4. On the following day, have students complete the illustrations by coloring them. Then have your students briefly tell about their animal or plant and then pin it to the correct location in your bulletin board rain forest.



5. Learn how we depend on rain forest products. Have each student research one of the following which come from rain forests or were first discovered there:

wood:

teak
mahogany
ebony
satinwood
rosewood
balsa
purple heart

spices:

allspice
paprika
cayenne
chili peppers
cardamon
cinnamon
cloves
nutmeg and mace
pepper
vanilla

houseplants:

philodendrons
bromeliads
orchids
Ficus (rubber tree and others)

fibers:

rattan
jute
kapok
bamboo
hemp

beverages:

coffee
tea
chocolate

essential oils:

patchouli oil
rosewood oil
eucalyptus oil
sandalwood oil
oil of lime
bay oil

gum and resins

rubber
chicle gum
balata

drugs and chemicals:

strychnine
ipecacuanha
reserpine
derris
quinine

Each of these lists could be much longer. If your students give oral reports on these, have them show the original location where these plants were found on a world map. Many students will be able to bring samples of these materials to class.

An excellent reference for a Rain Forest unit is *Jungles*, edited by Edward S. Ayensu, Crown Publishers, 1980.

FISH PARTS

Before:

Discuss with the students the functions of the various external parts of the fish that they will observe during their visit to the Aquarium. These parts can be listed on the board or on a chart. Using the activity sheet, have the students label the external parts of a fish. The more experienced student could also identify the function of the parts labeled.

During:

Remind the students that they should observe the way the fish at the Aquarium use their fins to move. They should find at least three different ways of using fins and tails to move.

After:

Upon return, discuss swimming methods.

Average fish:

tail provides power and fins provide direction and stability; S-shaped wave passes down body

Parrotfish and wrasses:

scull with pectoral fins

Triggerfish:

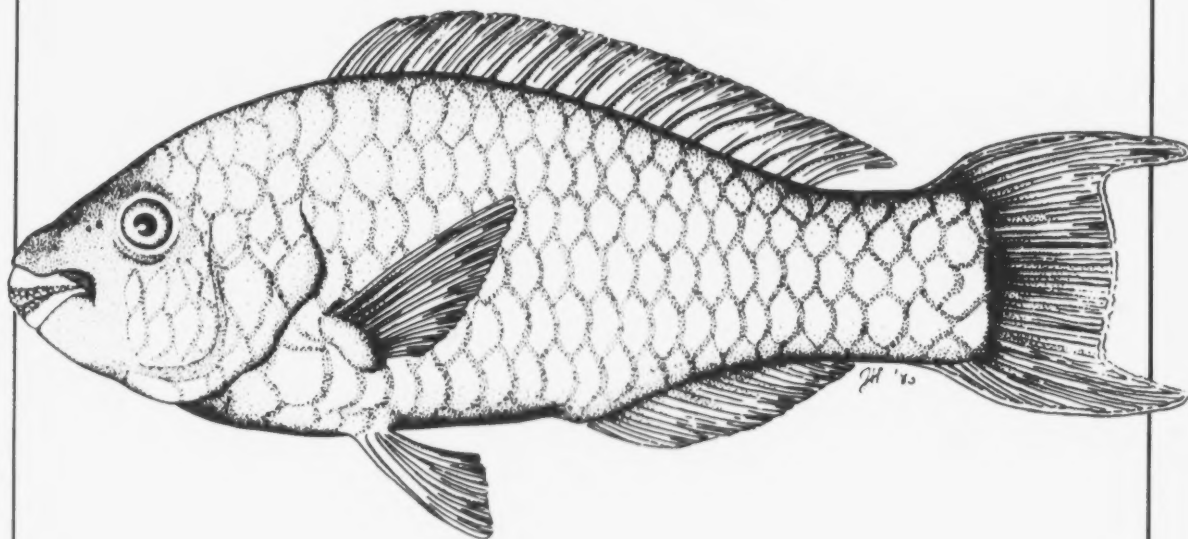
dorsal and anal fins move in S-shaped wave to provide power

Seahorse:

dorsal fin and pectoral fins work together

Combine with Make-A-Fish, allowing your students to demonstrate their powers of observation.

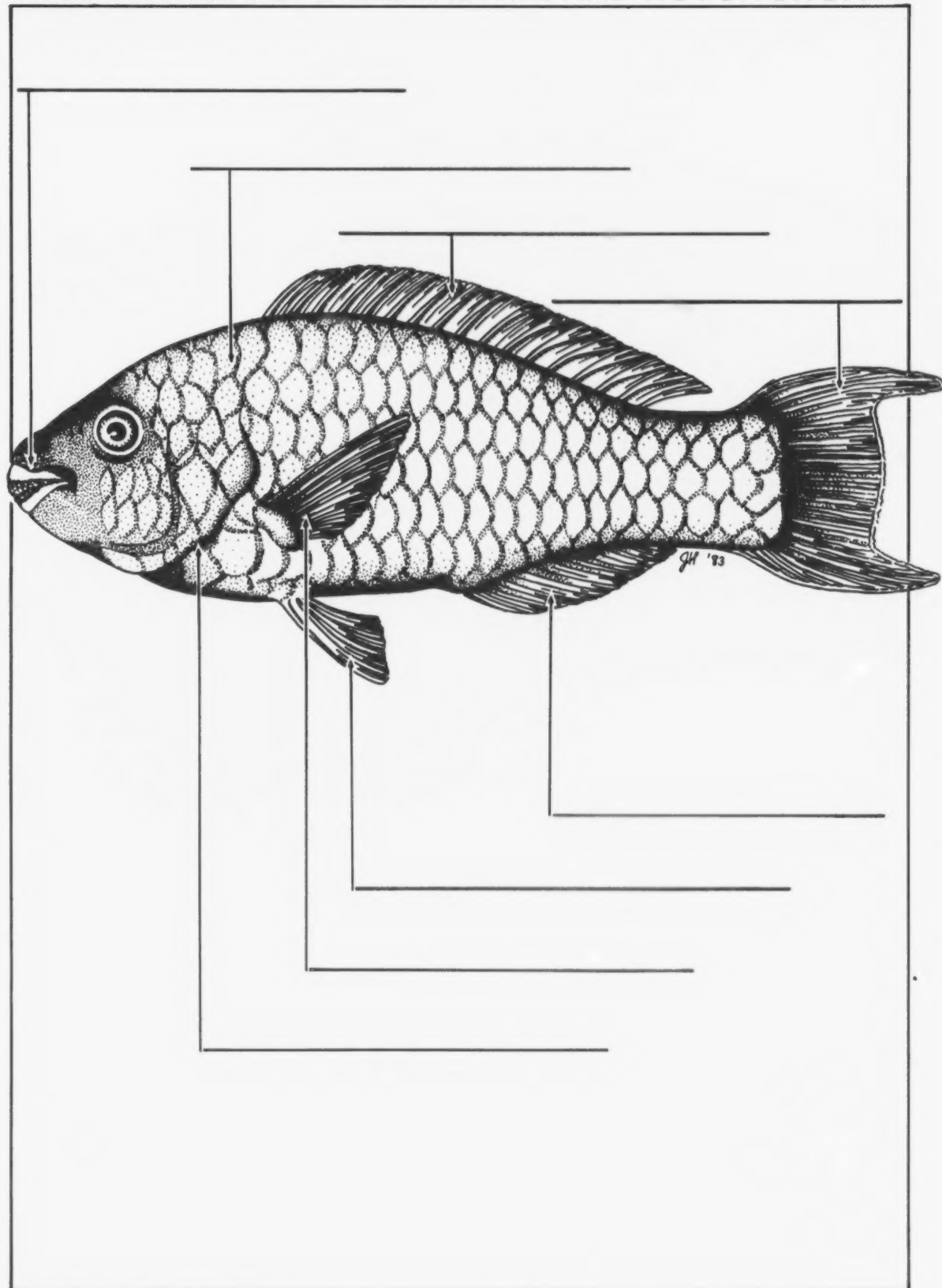
FISH PARTS



SCALES	TAIL FIN	GILLS	ANAL FIN
PECTORAL FIN	DORSAL FIN	PELVIC FIN	MOUTH

CUT AND PASTE LABELS

FISH PARTS LABEL THE PART AND ITS FUNCTION



MAKE-A-FISH

Before:

Prior to your visit to the Aquarium, explain to the students that each of them will construct a fish as an assignment after their visit. Explain that each student will make a selection during their visit, but that the actual construction will take place the following day.

During:

You may furnish index cards to each student or to the chaperones to record pertinent information or a simple sketch of the fish each student has selected.

After:

The following day, construct your fish after the class has discussed the external structure of a fish—fins, tail, etc. Some suggestions for materials to be used include:

fruits
styrofoam
construction paper
fabric scraps
pine cones
papier mache

vegetables
wood
buttons
water-based paints
coat hangers
pipe cleaners
ping pong balls

clay
rocks
sequins
tissue paper
packing material
tooth picks

Combine with fish anatomy activity as a pre-trip activity.

OPPOSITES

Name _____

The words listed on the left side of the page can be matched with an opposite word on the right side of the page. All of these words relate to marine animals or habitats. A short definition is next to the word on the left side of the page. Read the definition and the word. Then draw a line from the word to its opposite on the right side of the page. Write a short definition of the word as you identify the words.

DEFINITION	WORD	WORD	WRITE THE DEFINITION
living on land	terrestrial	pelagic	_____
living on the ocean, river or lake bottom	benthic	exoskeleton	_____
permanently attached	sessile	nocturnal	_____
in the front	anterior	saline	_____
migrates from salt to freshwater to spawn	anadromous	carnivore	_____
on the back	dorsal	larvae	_____
egg laying	oviparous	catadromous	_____
animal hunting food	predator	ventral	_____
plant eater	herbivore	aquatic	_____
full grown animal	adult	mobile	_____
without oxygen	anaerobic	viviparous	_____
internal skeleton	endoskeleton	aerobic	_____
water that isn't salty	fresh	posterior	_____
active in the daytime	diurnal	prey	_____

OPPOSITES

Name _____

The words listed on the left side of the page can be matched with an opposite word on the right side of the page. All of these words relate to marine animals or habitats. A short definition is next to the word on the left side of the page. Read the definition and the word. Then draw a line from the word to its opposite on the right side of the page. Write a short definition of the word as you identify the words.

DEFINITION	WORD	WORD	WRITE THE DEFINITION
living on land	terrestrial	pelagic	<i>living in the open water</i>
living on the ocean, river or lake bottom	benthic	exoskeleton	<i>external skeleton (crab)</i>
permanently attached	sessile	nocturnal	<i>active at night (squirrelfish)</i>
in the front	anterior	saline	<i>salty</i>
migrates from salt to freshwater to spawn	anadromous	carnivore	<i>meat eater (shark, seal)</i>
on the back	dorsal	larvae	<i>immature, early stage</i>
egg laying	oviparous	catadromous	<i>migrates from fresh to saltwater to spawn (eel)</i>
animal hunting food	predator	ventral	<i>on the bottom</i>
plant eater	herbivore	aquatic	<i>living in the water</i>
full grown animal	adult	mobile	<i>moves from place to place</i>
without oxygen	anaerobic	viviparous	<i>live bearing (seal, sea lion)</i>
internal skeleton	endoskeleton	aerobic	<i>with oxygen</i>
water that isn't salty	fresh	posterior	<i>in the rear</i>
active in the daytime	diurnal	prey	<i>food</i>

VISIT FROM THE DEEP

A fascinating pre-visit activity for older students focuses on the use of self-contained underwater breathing apparatus—SCUBA—to explore the seas. Schedule your Aquarium visit to allow your students to watch the divers feed the fish in the Atlantic Coral Reef. Inquire about the feeding schedule before you make your reservations.

Have a certified diver bring his/her equipment to class for a program. Where do you find one? Start by checking with your fellow teachers. Then ask students about parents or older brothers or sisters who might dive. Try a local dive shop to see if they provide speakers as public relations projects.

Talk with the person ahead of time and request that they stress:

- safety and proper training
- equipment and its proper use
- basic principles of physical and life science that govern diving

Supplemental Activities:

1. Assign groups of individual students the following activities based on their interests. Have them report their findings to the class.
 - a. Research SCUBA ahead of time in order to interview the SCUBA expert for the class.
 - b. Research the career prospects for commercial divers. Include a list of the kinds of companies that employ divers.
 - c. Research the early development of SCUBA and the role of "frog men" during the second World War.
 - d. Research the scientific use of divers and "subs" to expand our understanding of the marine environment.
2. Obtain a copy of the National Geographic special "Dive to the Edge of Creation" for your class. It may be available as video tape in your school. This is one of the best science films ever made. It follows the process of scientific discovery and demonstrates scientists are "real people" who make bad jokes, work day and night when they must and get very excited about their work.
3. Use underwater pictures or items to encourage your students to write an underwater adventure.

ANIMAL MOVEMENT

Name _____

The National Aquarium in Baltimore has many kinds of animals. All have many activities in common. One of the best activities to observe is movement. Many of the animals have special body adaptations for movement. Observe one member of each of the animal groups and complete the chart as you travel through the Aquarium.

<i>Group</i>	<i>Name and Location</i>	<i>Method of Locomotion</i>	<i>Body Adaptation</i>
Fish			
Reptile			
Bird			
Mammal			
Invertebrate			

THE ADVANTAGES OF DIFFERENT FISH BODY SHAPES

Name _____

The basic body shape of a fish can determine how fast it moves through the water. The body shape can also offer protection and determine feeding locations. When you visit the National Aquarium in Baltimore, locate one fish with each of the body shapes shown and complete the chart.

<i>Body Shape Head to Tail</i>	<i>Name of Fish</i>	<i>Where Found in Aquarium</i>	<i>Where Found in Wild</i>	<i>Advantage of Body Shape</i>
 Blunt Cone Shaped				
 Long and Slim				
 Pointed Nose				
 Angular Sides				
 Short and Broad				

Name _____

SEA LION OBSERVATIONS

Watch the sea lions swim around the central *indoor pool* and then answer these questions.

How do the sea lions steer when they are swimming underwater?

Which flippers do the sea lions use for power when they are swimming?

Can a sea lion move very well on the land? _____

Give a reason for your answer. _____

What do their ears look like? _____

If you were watching a behavior and feeding demonstration, answer the following questions.

How does the trainer get the sea lion to obey the commands?

What signal does the trainer use to let the sea lions know their behavior is correct?

What is the sea lion's reward for the right behavior?

What happens if the sea lion doesn't perform the right behavior?



Name _____

SEA LION OBSERVATIONS

Watch the sea lions swim around the central indoor pool and then answer these questions.

How do the sea lions steer when they are swimming underwater?

They use their rear flippers for steering and occasionally their front flippers.

Which flippers do the sea lions use for power when they are swimming?

large front flippers provide power

Can a sea lion move very well on the land? better than a seal

Give a reason for your answer. sea lion can support their weight on rear flippers and walk on all four

What do their ears look like? small ear flaps cover ear holes

If you were watching a behavior and feeding demonstration, answer the following questions.

How does the trainer get the sea lion to obey the commands?

by offering a reward of fish if the sea lion behaves correctly

What signal does the trainer use to let the sea lions know their behavior is correct?

the trainer blows the whistle

What is the sea lion's reward for the right behavior?

fish

What happens if the sea lion doesn't perform the right behavior?

no fish



Name _____

SEAL OBSERVATIONS

Name the two species of seals in the *outdoor pool*.

1. _____ 2. _____

What are the two ways you can tell the species apart?

1. _____

2. _____

How do the seals steer when they are swimming underwater?

Which flippers do the seals use for power when they are swimming?

Can a seal move very well on the land? _____

Give a reason for your answer. _____

What do their ears look like? _____

How does a seal breathe without getting water in its nose?

What is the purpose of the layer of blubber under the seal's skin?



Name _____

SEAL OBSERVATIONS

Name the two species of seals in the outdoor pool.

1. grey seal 2. harbor seal

What are the two ways you can tell the species apart?

1. grey seal has a much longer snout
2. grey seal is much larger, darker color

How do the seals steer when they are swimming underwater?

they steer with their small front flippers

Which flippers do the seals use for power when they are swimming?

large rear flippers

Can a seal move very well on the land? no

Give a reason for your answer.

they cannot use their rear flippers for locomotion.

What do their ears look like?

small ear holes

How does a seal breathe without getting water in its nose?

It closes its nostrils tightly except when breathing.

What is the purpose of the layer of blubber under the seal's skin?

It keeps the seal warm in cold water.



Name _____

SEAL AND SEA LION REVIEW

What are the differences between seals and sea lions? Read the questions and then check the right answer.

- | | | |
|--|----------|--------------|
| 1. Which animal has larger front flippers? | ___ seal | ___ sea lion |
| 2. Which animal uses its large rear flippers as the main power for swimming? | ___ seal | ___ sea lion |
| 3. Which animal uses its large front flippers for swimming power? | ___ seal | ___ sea lion |
| 4. Which animal has ear flaps around its ear holes? | ___ seal | ___ sea lion |
| 5. Which animal can bend its rear flippers forward? | ___ seal | ___ sea lion |
| 6. Which animal barks? | ___ seal | ___ sea lion |
| 7. Which animal performs the most behaviors? | ___ seal | ___ sea lion |
| 8. Which animal can move on land the best? | ___ seal | ___ sea lion |

Seals and sea lions have many similarities. Answer the following questions about how these animals are alike.

1. Seals and sea lions are part of a family called Pinnipeds which means fin-footed ones. Do you think they spend most of their lives in the water or on land?
2. The rich milk from the mother seal or sea lion helps the pup grow a thick layer of blubber. What is the purpose of this layer of fat?
3. Seals and sea lions can stay under water for as long as 10 minutes at a time. How can they manage to make one breath last so long?

Name _____

SEAL AND SEA LION REVIEW

What are the differences between seals and sea lions? Read the questions and then check the right answer.

- | | | |
|--|----------|--------------|
| 1. Which animal has larger front flippers? | ___ seal | ✓ sea lion |
| 2. Which animal uses its large rear flippers as the main power for swimming? | ✓ seal | ___ sea lion |
| 3. Which animal uses its large front flippers for swimming power? | ___ seal | ✓ sea lion |
| 4. Which animal has ear flaps around its ear holes? | ___ seal | ✓ sea lion |
| 5. Which animal can bend its rear flippers forward? | ___ seal | ✓ sea lion |
| 6. Which animal barks? | ___ seal | ✓ sea lion |
| 7. Which animal performs the most behaviors? | ___ seal | ✓ sea lion |
| 8. Which animal can move on land the best? | ___ seal | ✓ sea lion |

Seals and sea lions have many similarities. Answer the following questions about how these animals are alike.

1. Seals and sea lions are part of a family called Pinnipeds which means fin-footed ones. Do you think they spend most of their lives in the water or on land? *Both spend most of their lives in water and both haul out on land during the mating season and for the birth of their pups.*
2. The rich milk from the mother seal or sea lion helps the pup grow a thick layer of blubber. What is the purpose of this layer of fat? *It is insulation against the cold, and it helps in streamlining body shape.*
3. Seals and sea lions can stay under water for as long as 10 minutes at a time. How can they manage to make one breath last so long? *They can restrict the flow of oxygen-rich blood to only vital organs.*

Name _____

ATLANTIC CORAL REEF EXHIBIT

1. This large exhibit is modeled after the living coral reefs which you might see off the coast of

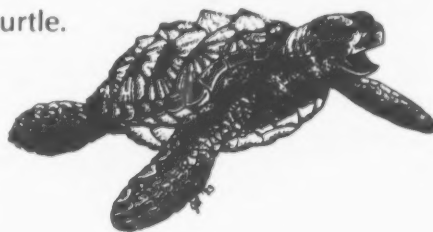
a. California b. Florida c. Maine d. Phillipine Islands

The corals and other invertebrates are models but the fish are very much alive.

2. The only reptile in the tank is a hawksbill turtle.

a. How do you think it gets its name?

b. Name one major difference between this turtle and land turtles.



3.



Yellow, white and black pork-fish are obvious at the "open end" of the Coral Reef exhibit. Watch them as they "clean" other fish. They are eating parasites off of other fish.

Describe the behavior of the cleaner and the fish getting cleaned.

4.



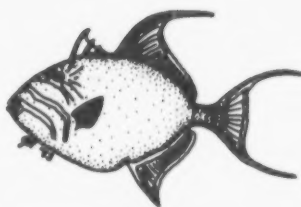
a. In what part of the exhibit does the large tarpon tend to swim?

Can you guess why? _____

b. Observe its mouth. Is this fish a bottom feeder or surface feeder?

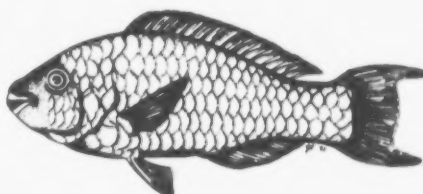
c. Describe how the tarpon swims. What part of its body does it use?

5. a. There are several types of triggerfish in the exhibit. Watch them and describe when the "trigger" is raised.

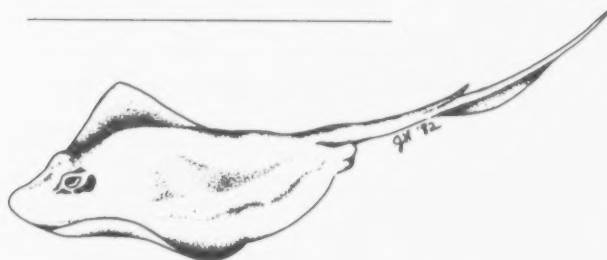


- b. Describe how the triggerfish swims. What parts of the body does it use?

6. a. Describe the parrotfish's mouth and draw a close-up of the teeth in the space at the right. What might these teeth be adapted for?



7.



- a. Where does the stingray spend most of its time?

- b. The mouth is located _____

What do you imagine this fish eats? _____

- c. Describe how the ray swims. What part of its body does it use?

8. a. List some imaginative words which describe this fish.



- b. Describe how it swims. What parts of its body does it use?

- c. Where in the water column does the lookdown swim?

___ bottom

___ middle

___ upper portion

- d. Does it swim alone or in a school? _____

Name _____

ATLANTIC CORAL REEF EXHIBIT

1. This large exhibit is modeled after the living coral reefs which you might see off the coast of

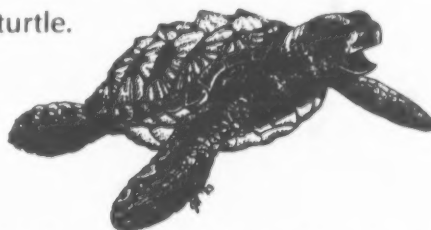
a. California **(b.) Florida** c. Maine d. Phillipine Islands

The corals and other invertebrates are models but the fish are very much alive.

2. The only reptile in the tank is a hawksbill turtle.

a. How do you think it gets its name?

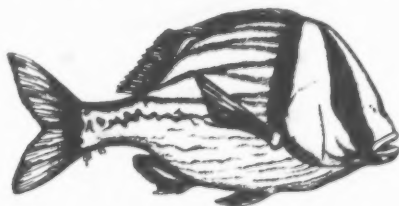
beak shaped like a hawk's beak



b. Name one major difference between this turtle and land turtles.

feet are flippers which act as paddles for swimming

3.



Yellow, white and black porkfish are obvious at the "open end" of the Coral Reef exhibit. Watch them as they "clean" other fish. They are eating parasites off of other fish.

Describe the behavior of the cleaner and the fish getting cleaned.

large fish holds very still, often in a strange position, and almost seems to be begging to be cleaned

4.



a. In what part of the exhibit does the large tarpon tend to swim?

end that is open; not in dense coral

Can you guess why? too big, might get stuck

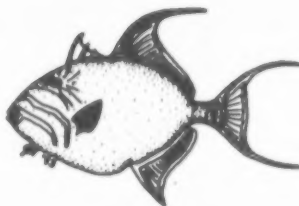
b. Observe its mouth. Is this fish a bottom feeder or surface feeder?

surface

c. Describe how the tarpon swims. What part of its body does it use?

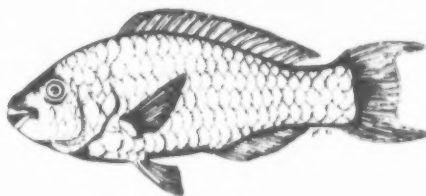
almost still, then moves fast; tail

5. a. There are several types of triggerfish in the exhibit. Watch them and describe when the "trigger" is raised.
when in reef or meet another triggerfish



- b. Describe how the triggerfish swims. What parts of the body does it use?
uses wave motion of top and bottom (dorsal+anal) fin

6. a. Describe the parrotfish's mouth and draw a close-up of the teeth in the space at the right. What might these teeth be adapted for?
Scraping



7.



- a. Where does the stingray spend most of its time?
on the bottom or swimming

- b. The mouth is located on the underside

What do you imagine this fish eats? bottom dwelling animals, invertebrates

- c. Describe how the ray swims. What part of its body does it use?
uses wave motion along sides of body (wings)

8. a. List some imaginative words which describe this fish.
flat face, very thin



- b. Describe how it swims. What parts of its body does it use?
rapid back and forth motion of tail

- c. Where in the water column does the lookdown swim?

☐ bottom

☐ middle

☒ upper portion

- d. Does it swim alone or in a school? it always schools

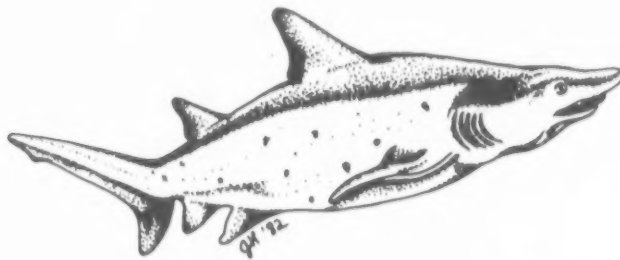
OBSERVATION SHEET

Open Ocean Tank

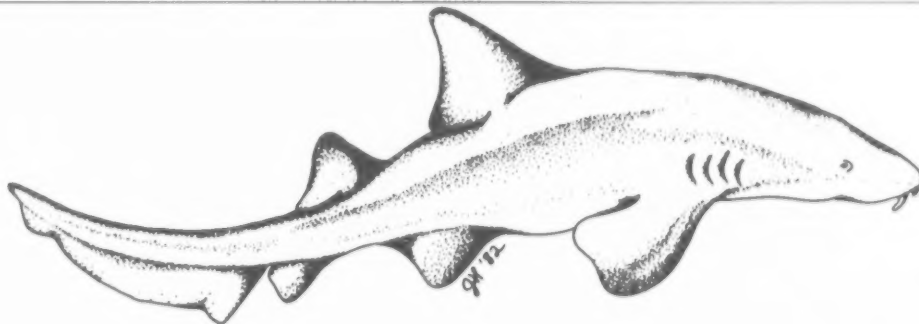
Name _____

1. Most of the Aquarium's sharks and rays are in the Open Ocean Tank, one of the final exhibits. However, look for sharks and rays in other areas as you go through the building. You may be surprised! Where else are they?

2. Spend some time observing the fish in the Open Ocean Tank. Read the identification labels and try to figure out which fish is which. This will help you in answering questions. Volunteer Exhibit Guides will also be glad to help you.



3. Examine the teeth of the SANDTIGER SHARK as it passes by. List at least three differences between this shark's teeth and your teeth.



4. The NURSE SHARK has two whisker-like barbels which extend from its upper mouth. The barbels are not teeth. What do you think their purpose is?

Can you name another fish which has barbels? _____

5. The mouth of the SOUTHERN STINGRAY is on its underside. Since this ray often rests on the bottom, how can it draw in sea water, which contains oxygen, to pass over its gills? (Hint—look at the area around the eyes.)

6. As a shark swims by, take a good look at its skin and describe what you observe.

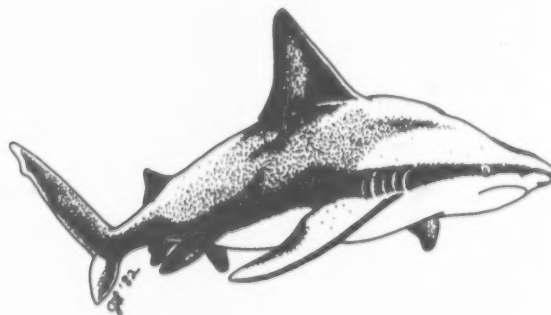
What do you think shark skin feels like? _____

7. Do you see any sharks which swim constantly, never stopping. If so, which ones?

If they have to swim all the time, when or how do they sleep? _____

8. You can tell if a shark is a fast swimmer by looking at the dorsal (top) fins. If the fin closest to the tail is a great deal smaller than the first fin, the shark is a fast swimmer. Look at the sharks in the Open Ocean Tank. Which are fast swimmers?

Which are *not* considered fast swimmers? (You may even see some sharks resting on the bottom.)



OBSERVATION SHEET

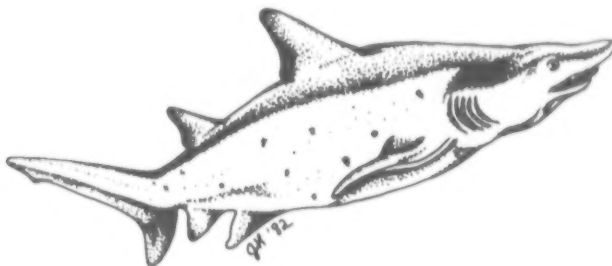
Open Ocean Tank

Name _____

1. Most of the Aquarium's sharks and rays are in the Open Ocean Tank, one of the final exhibits. However, look for sharks and rays in other areas as you go through the building. You may be surprised! Where else are they?

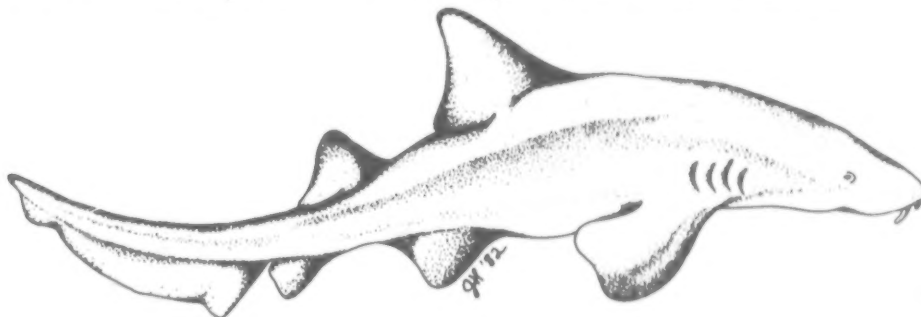
continental shelf, kelp forest, coral reef

2. Spend some time observing the fish in the Open Ocean Tank. Read the identification labels and try to figure out which fish is which. This will help you in answering questions. Volunteer Exhibit Guides will also be glad to help you.



3. Examine the teeth of the SANDTIGER SHARK as it passes by. List at least three differences between this shark's teeth and your teeth.

rows of teeth, serrated edges, no molars



4. The NURSE SHARK has two whisker-like barbels which extend from its upper mouth. The barbels are not teeth. What do you think their purpose is?

finding food on the bottom

Can you name another fish which has barbels? catfish

5. The mouth of the SOUTHERN STINGRAY is on its underside. Since this ray often rests on the bottom, how can it draw in sea water, which contains oxygen, to pass over its gills? (Hint—look at the area around the eyes.)

uses hole behind eyes (spiracle) to take in water and pumps it out gill slits on bottom

6. As a shark swims by, take a good look at its skin and describe what you observe.

appears to have tiny shiny bumps

What do you think shark skin feels like? rough

7. Do you see any sharks which swim constantly, never stopping. If so, which ones?

brown sharks and sand tiger sharks
usually swim

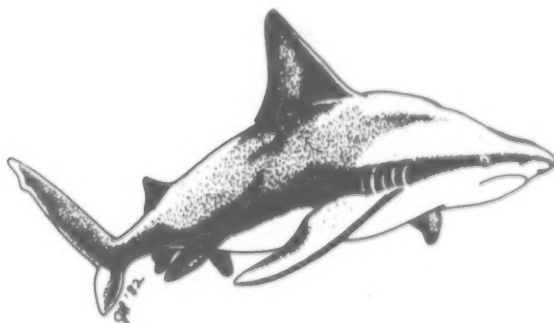
If they have to swim all the time, when or how do they sleep? they don't
sleep like we do

8. You can tell if a shark is a fast swimmer by looking at the dorsal (top) fins. If the fin closest to the tail is a great deal smaller than the first fin, the shark is a fast swimmer. Look at the sharks in the Open Ocean Tank. Which are fast swimmers?

brown sharks

Which are *not* considered fast swimmers? (You may even see some sharks resting on the bottom.)

nurse sharks



AQUARIUM DETECTIVES

Xerox these assignments and attach them to 3" x 5" cards. Distribute the cards to individual students or groups. A chaperone may take responsibility for the cards for a group.

Invertebrates (Children's Cove Level 4)

Aquarium Detectives, you will learn about animals without backbones—invertebrates. In the Children's Cove you may even touch some. Each pick one of the animals in the Cove and study how it moves, feeds, sees and defends itself. Exhibit guides stationed in the Cove can help you learn. Be prepared to share what you learned with the class.

Skeletons (Level 3 Near Moving Walkway)

As Aquarium Detectives, each person in your group is to learn about the different animals represented by a skeleton. Group members will report briefly on their findings upon returning to class.

Wall Graphics (Level 3)

Your job as Aquarium Detectives is to locate the wall of graphics on Level 3. These pictures show distinctive qualities about sea life. Each member of the group should accept responsibility for an item such as eyes, gills, tails, fish middles, etc., and be prepared to discuss or draw the variations observed upon returning to class.

Open Ocean Tank (Lower Ring Tank)

This is a most interesting assignment, Aquarium Detectives. The lower level permits visitors to observe sharks and rays in a setting much like that found in nature. Your group should arrange its responsibility to examine shark swimming behavior, body characteristics, teeth arrangement, shark sensing devices. Compare and contrast sharks and rays.

Surviving Through Adaptation (Level 3)

Aquarium Detectives, as you know, survival is important. Sea animals have devised many methods to increase their chances for survival. Some of these methods include hiding, lurking, displaying, occupying, growing, and migrating. Pick one of these methods of utilizing these strategies. Look carefully! Look at the pictures as well as the live animals. Be prepared to report your findings upon returning to class.

Feeding Techniques (Level 3)

Detectives, your task is to find some of the different feeding methods used by sea life. Survival for most forms is strongly linked to the specific adaptations that each species exhibits. Feeding is no exception. Picking, sucking, stinging, filtering, slurping, grazing, digging, grasping, burrowing, and shocking are some of the methods used by sea life to survive in specific environmental zones. Each member of your group should select two of the above feeding techniques and report on these upon returning to class.

Habitat Theater (Level 3)

Your assignment as Aquarium Detectives is to go to the Habitat Theater. The program being presented explains how sound is important to animals. Each member of your group should be prepared to explain the unique characteristics of animal sounds and what purpose they have.

Rain Forest (Uppermost Level)

As Aquarium Detectives you will venture into the Rain Forest. Life in the Rain Forest is stratified from the tree tops to the forest floor. Be careful, quiet Detectives and you will see what many visitors miss. Group members should select specific creatures or plants to study and be prepared to report some facts about your creature or plant. Look for a volunteer exhibit guide if you need help.

Atlantic Coral Reef (Ring Tank)

Aquarium Detectives, it is your task to examine the ring tanks. These huge circular tanks permit you to make an imaginary descent into the ocean. The first ring of tanks shows life in the Atlantic Coral Reef. Your group should divide its responsibility but should gain information related to feeding habits, cleaning behavior, territorialism, stratification, predator/prey relations, and swimming characteristics.

DEMONSTRATING THE WATER CYCLE

The Aquarium exhibit Maryland: Mountains to the Sea is a good demonstration of the water cycle. Beginning with the rain in the Allegheny Pond, the exhibits follow the path of water from the mountains to the Atlantic Shelf. You can demonstrate how the water gets from the sea back to the mountains by building a model of part of the water cycle.

Here are two methods of demonstrating how rain or snow forms from the salty sea:

Materials

Method 1

ring stand
wire gauze
two 4" iron rings
Bunsen burner or propane tank
water
table salt
ice
two 1000ml beakers

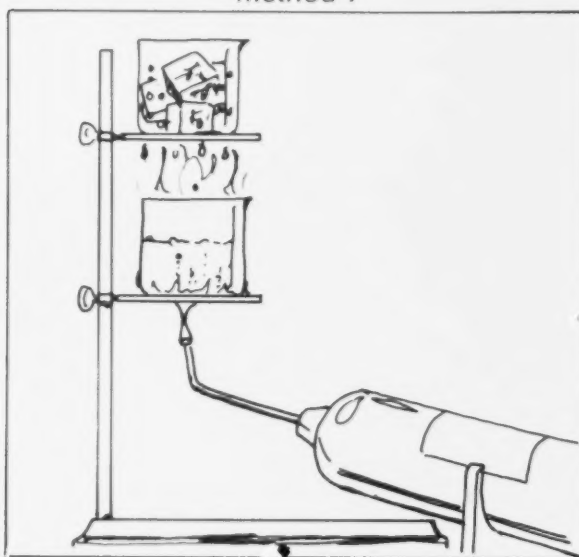
Method 2

hot plate or electric skillet
pots
water
table salt
ice

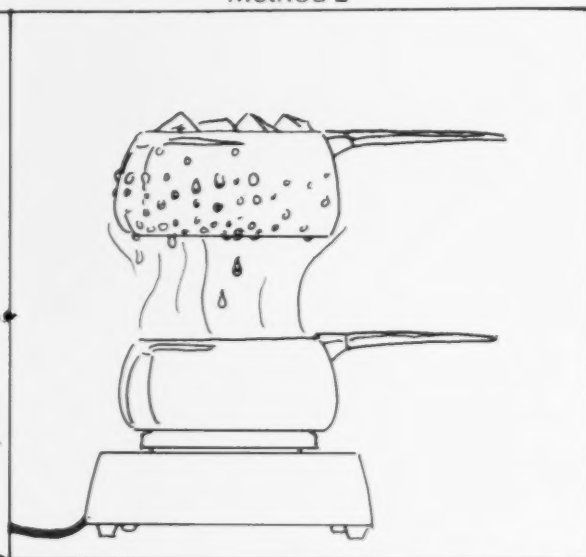
Procedure

Add salt to the container which will be heated. Heat the water until it begins to boil. The container on top should be filled with ice and placed several inches above the heated container with salt water. Check the diagram for each method.

Method 1



Method 2



Demonstration Results

The torch or hot plate represents heat energy supplied by the sun. This heat causes the water to turn into steam. This represents water *evaporated* from the sea. As the steam rises it comes into contact with the cold upper atmosphere. In this case, the container full of ice. The water *condenses* into droplets when warm moist air hits cold upper air. Falling droplets represent *precipitation* (rain, snow, sleet or hail).

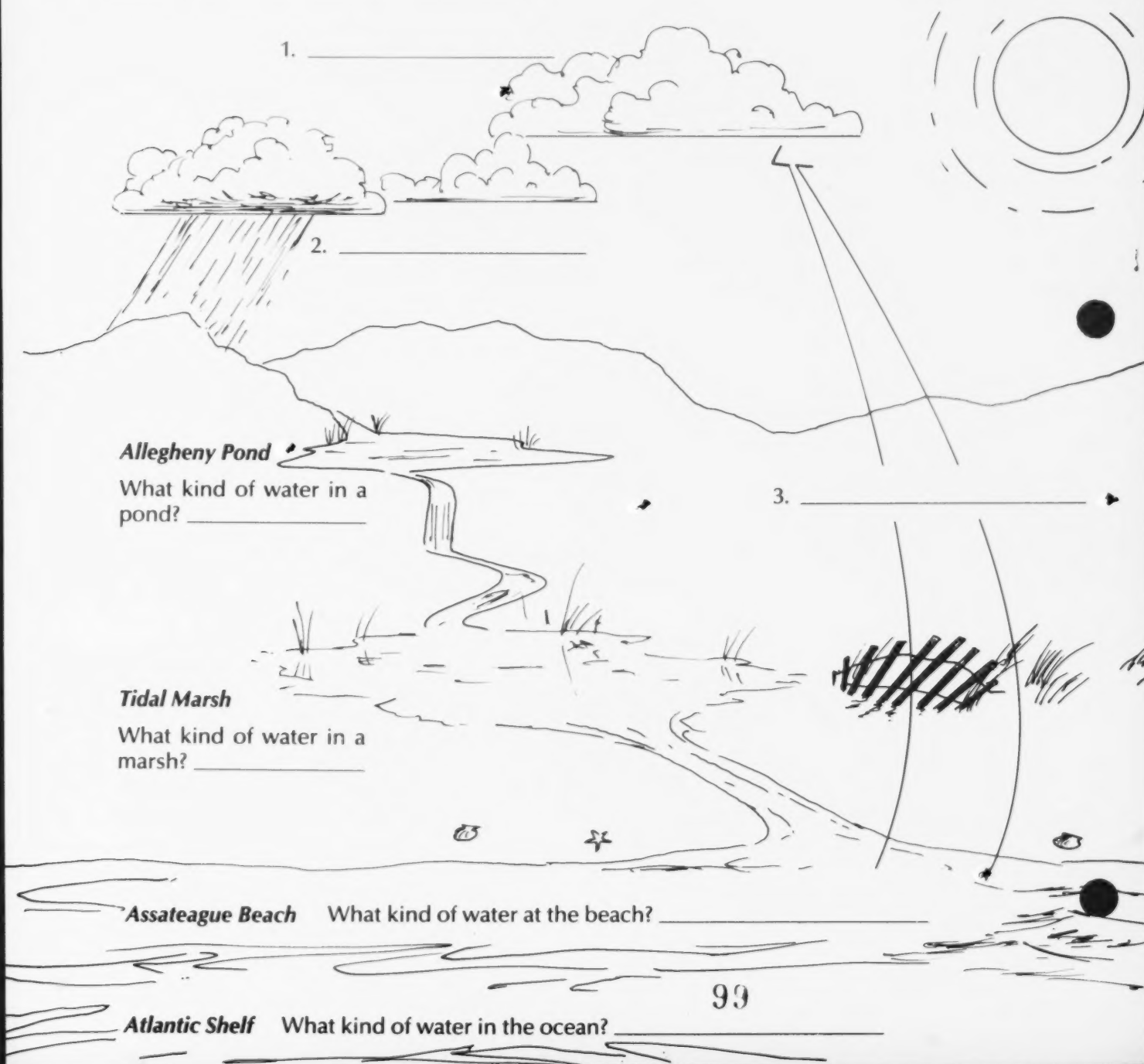
Have students check the salinity of the falling droplets by tasting them. (Be careful not to get burned.) Are the drops salty or fresh? Why?

MARYLAND: MOUNTAINS TO THE SEA

The Aquarium exhibit Maryland: Mountains to the Sea is a good demonstration of the water cycle. Beginning with the rain in the Allegheny Pond the four exhibits follow the path of water from the mountains to the ocean.

Fill in blanks 1, 2 and 3 in the drawing with the terms condensation, precipitation and evaporation.

Four habitats are represented in this drawing: Allegheny Pond, Tidal Marsh, Assateague Beach, and Atlantic Shelf. Each habitat is an exhibit in the Maryland: Mountains to the Sea gallery. Think about the water cycle demonstration and determine if the water in each habitat is fresh, brackish (a mix of fresh and salt water), or salty. Use one of these words to label each habitat in the drawing.



THE WATER CYCLE
A CROSSWORD PUZZLE

Where does the water come from that fills Maryland's mountain streams and flows to the Atlantic Ocean? Water is constantly circulating in a sun-powered system in which water evaporates from the ocean and land and returns to the earth as (14) _____. A word you might hear on the evening weather report for rain or snow or sleet is (15) _____.

Some of the water that reaches the earth is immediately taken up by plants. Some of it turns to vapor and forms clouds. This is called (6) _____. Most water falls on the ground and finds its way to small (5) _____ which flow into (1) _____. The water that flows across the ground and into streams is called (8) _____. It often carries soil and decayed materials into the streams. Some water filters directly into the ground. Water flowing under the earth is called (10) _____. The (4 down) _____ is a measure of how close the water is to the surface of the ground.

Water changes as it flows from streams and rivers to the (13) _____. You can taste the difference in the (2) _____ of the water. Water in mountain streams tastes (11) _____. Water from the ocean tastes like (9) _____. When the water table is at or near the surface of the ground (4 across) _____ are formed. Some are freshwater and some are a combination of fresh and salt water called (3) _____. A wetland area with brackish water is called a salt (7) _____. An area like the Chesapeake Bay where fresh water from rivers and salt water from the ocean mix is called an (12) _____.

Waters from the Chesapeake Bay eventually flow into the Atlantic Ocean. What happens to the water after it reaches the ocean? Heat from the sun causes it to evaporate and the water (16) _____ begins all over again.

Words Used in This Puzzle

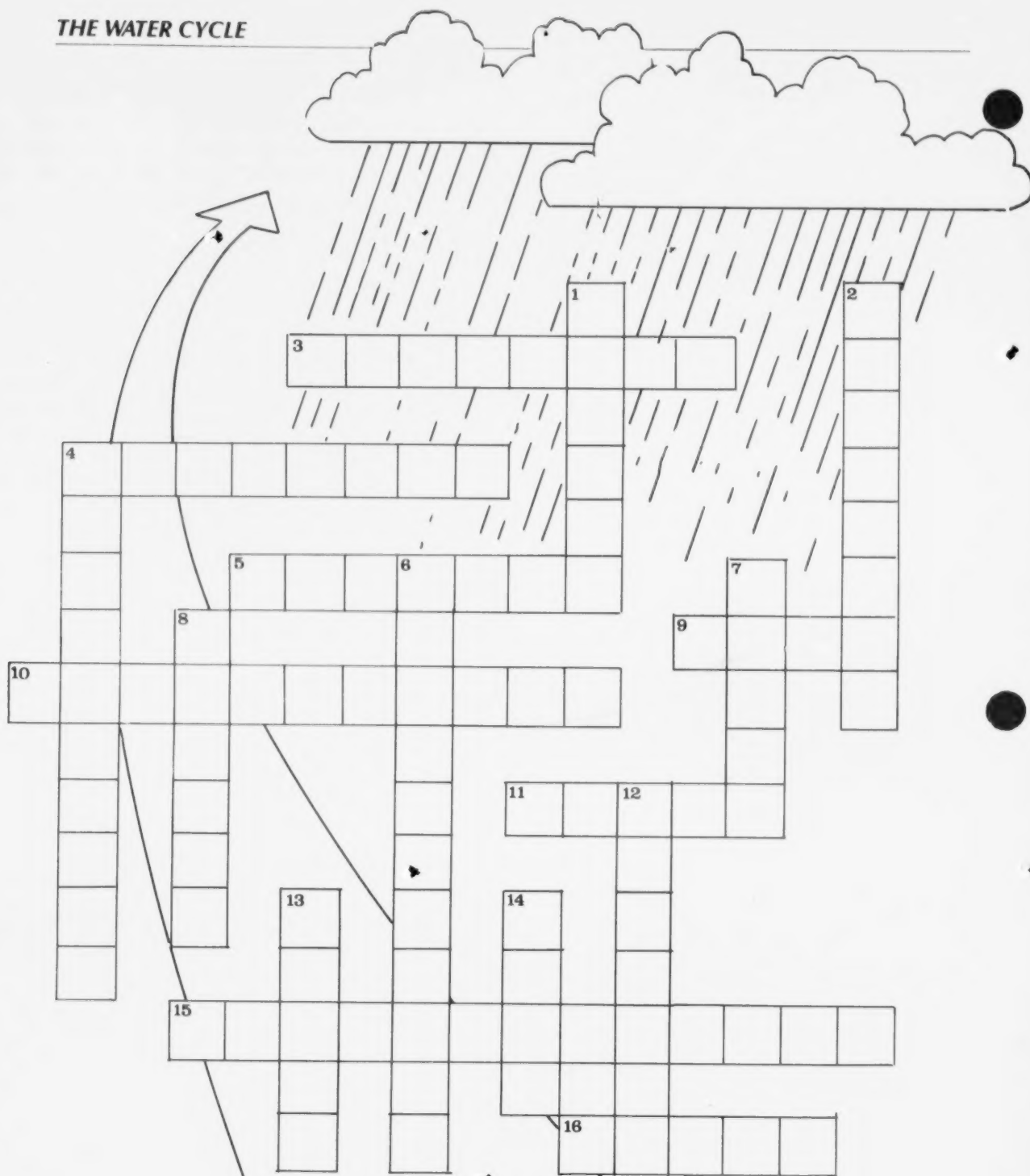
brackish
cycle
estuary
evaporation

fresh
marsh
ocean
precipitation

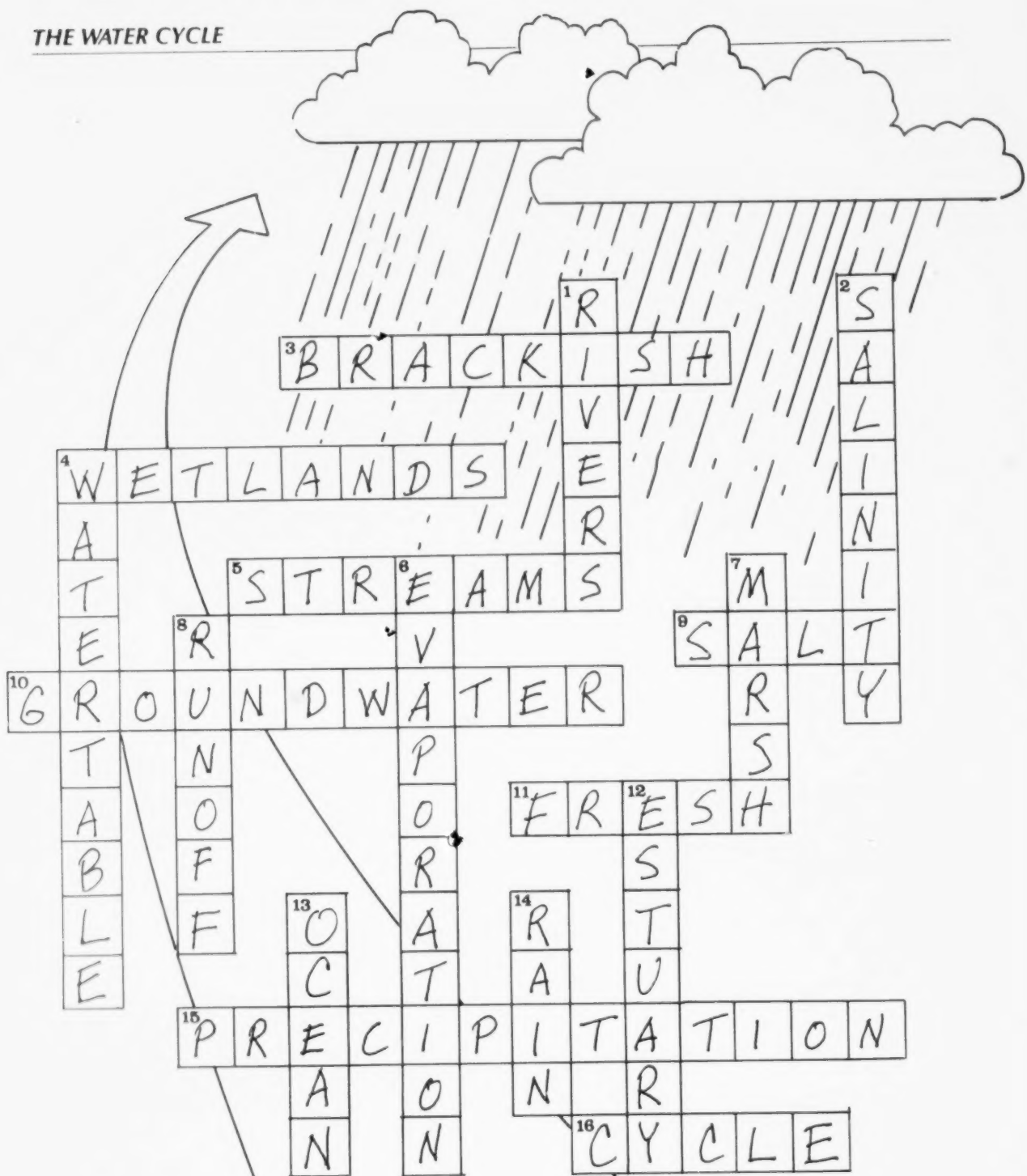
rain
rivers
runoff
salinity
salt

streams
groundwater
water table
wetlands

THE WATER CYCLE



THE WATER CYCLE



WHO AM I?

The following activity is designed for younger students and may be used by chaperones to guide children through some of the Aquarium displays. Reading the clues to the children before entering the National Aquarium in Baltimore may serve to focus their attention on the exhibits. This activity may also be helpful as an informal review of the field trip if used after visiting the Aquarium.

1. I am a fish that lights up in the dark. I'm a f _____.
2. I am a shark that has a head shaped like a tool. I'm a h _____.
3. I am the biggest skeleton at the Aquarium. I'm a w _____.
4. I am an animal with claws that has to borrow a shell. I'm a h _____.
5. I am a brightly colored fish with poisonous spines and I'm named after a big cat. I'm a l _____.
6. I am a crab that resembles something used by a horse. I'm a h _____.
7. My name is the same as that of a person who works at your school. I'm a n _____ shark.
8. I am active only at night and live in a tree. My movements are slow and I make the rain forest my home. I'm a s _____.
9. I am a bird with a colorful bill and love the cold coastal waters of the North Atlantic. The National Aquarium in Baltimore uses me as their mascot. I'm a p _____.
10. When most people hear the word forest, they think of trees, but I'm the principal ingredient of a forest at sea. I'm k _____.

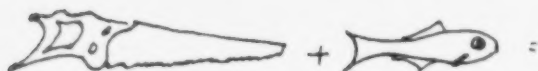
Answer Key

1. flashlightfish 2. hammerhead 3. whale 4. hermit crab 5. lionfish
6. horseshoe crab 7. nurse 8. sloth 9. puffin 10. kelp

THESE ARE ANIMALS YOU SAW AT THE AQUARIUM

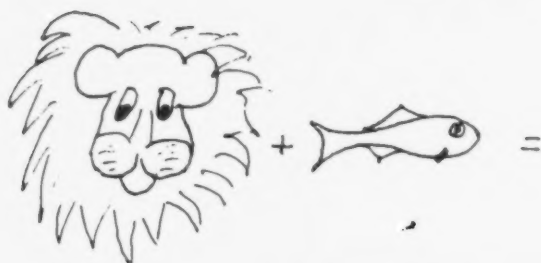
Name _____



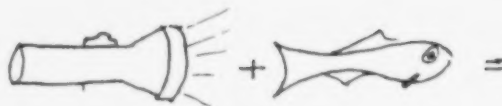


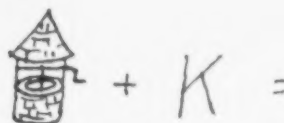


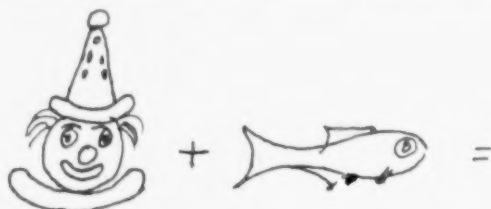


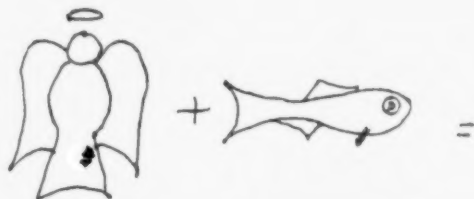


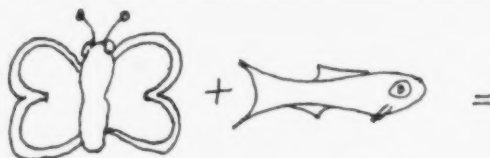


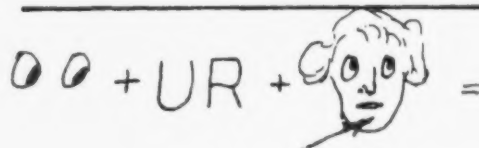














Attach the following "story starters" to 3" x 5" cards and have your students complete them after they visit the Aquarium. Emphasize creativity but ask them to include details they observe in the Aquarium.

I

After getting off the school bus, our group made its way to the main lobby of the National Aquarium in Baltimore. Immediately we sensed the special nature of this museum as sights and sounds greeted us. Our tour methodically carried us through exciting exhibits from one level to another when suddenly...

II

Having viewed many exhibits depicting various aspects of aquatic life, I began to wish that I might...

III

As we began our imaginary descent into the ocean in the Open Ocean (shark) ring tank, I became totally absorbed by the sights around me and began to imagine...

IV

I had just entered the hot, humid rain forest and was walking beneath many strange and beautiful plants, when...

V

Having donned my diving gear and completed my safety check, I was about to make what I thought would be another routine feeding dive. I carefully climbed down the ladder into the gigantic Atlantic Coral Reef Tank and...

SARDINES

(Selected Activities Requiring Diverse Independent New Experimental Studies)

SARDINES is offered as a way to use the National Aquarium in Baltimore as a focus for independent studies for older children. They may be used as pre- or post-visit lessons. And do not stop here. Use your imagination to add more.

Remember:

1. The activities are ambiguous. You want students to be creative in their thinking.
2. You may assign these to individuals or groups. You might let students choose their own or give the same one to everyone. Attach each to a 3" x 5" card.
3. Once the students get going, let them follow their own paths. You are a support person.
4. When things slow down, let the students share their ideas or help them find extensions.

SARDINES Suggestions

1. Collect ten water-related pictures from a picture file or magazine and write or tell a story that includes all the pictures.
2. Create a commercial for some aspect of the National Aquarium in Baltimore. Use any medium you choose and present it to the class. Consider selling something that no one wants or making a popular item undesirable.
3. Give a "fish eye" view of the Aquarium.
4. Find a cause and effect relationship in the living populations at the Aquarium.
5. Make a list of ten invisible things that are a part of the environment or lives of the plants and animals at the National Aquarium in Baltimore. For each give an example of how they affect the behavior of the plant or animal.

Examples: hunger, sound

6. During your visit to the Aquarium find things that represent energy. Sketch, photograph or describe these. Exchange and discuss descriptions.

Examples: motion, electricity

7. Find examples of possible predator-prey relationships in the Aquarium. List the animal you think would be a predator and the prey it might find in its exhibit. Ask an exhibit guide how the Aquarium deals with the problems of exhibiting predators and prey together.
8. Take a small tape recorder and blank tape on your field trip. Record the sounds you hear. Then use your recordings to answer these questions.
 - a. How did the sounds make you feel?
 - b. Did the sounds affect the actions of people around you?
 - c. Identify the sounds.
9. Find out what the history of the site of the National Aquarium in Baltimore has been and predict possible future changes.

RAIN FOREST WORD SEARCH

Things found in the Aquarium's South American Rain Forest are hidden here.

L O F P H U T T O P T
S K T L F S L O T H W
D Y W A L H E L S D P
R A I N F O R E S T M
I F S T L I Z A R D S
B J R S T J S L W T L
S E E R T S S O A R N

Rain Forest

Lizards

Birds

Plants

Sloth

Trees

FEEDING WORD SEARCH

These methods of feeding are demonstrated on level 3 in the Survival Through Adaptation Gallery. How many can you find?

R F B J U Y F G K I R V G K I C M K
C L N Y D X C J S G R T N L I P R S
S N P P L V R A G R A Z I N G G S J
M T Q W S L L O R U B V W I N N P R
W W C X L I N R A P O M O Y I I C M
A R G N I K C U S O M S R J G R H F
H C N O L T R P P M N B R V G E X E
E F G J O O I T I K L B U E I T S A
Y I L B V C U S N R E A B D D L H J
J M I S K R X A G L M Z T U V I K L
T Y S I L K M A E G N I D E E F A F
S N N P S J M R R I E D S N N O T T
V G N I G N I T S L U R P I N G L I

Burrowing

Digging

Feeding

Grasping

Filtering

Slurping

Sucking

Picking

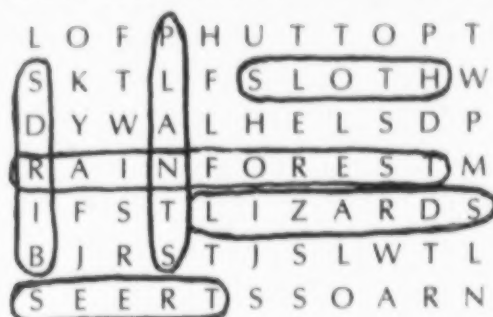
Grazing

Stinging

SOLUTIONS TO WORD SEARCHES

RAIN FOREST WORD SEARCH

Things found in the Aquarium's South American Rain Forest are hidden here.



Rain Forest

Lizards

Birds

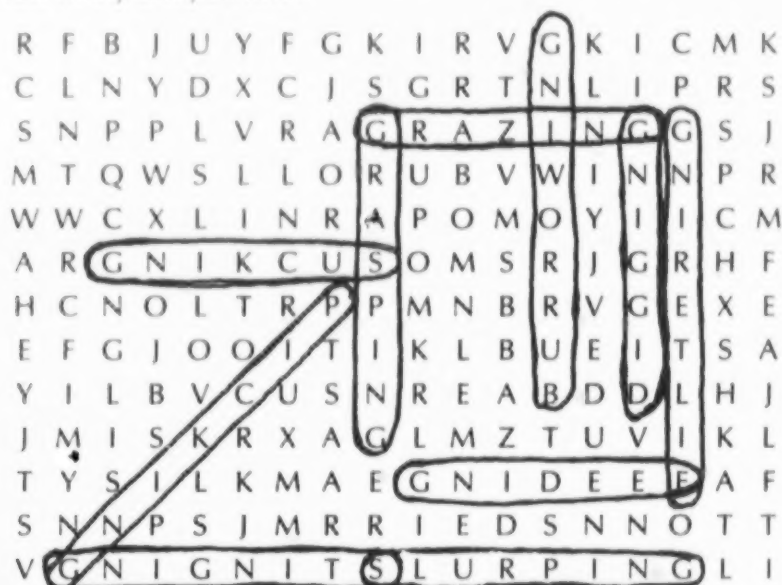
Plants

Sloth

Trees

FEEDING WORD SEARCH

These methods of feeding are demonstrated on level 3 in the Survival Through Adaptation Gallery. How many can you find?



Burrowing

Digging

Feeding

Grasping

Filtering

Slurping

Sucking

Picking

Grazing

Stinging

AQUARIUM PUZZLE

These are plants, animals and ideas you should have seen during your visit. The locations are given to help you remember.

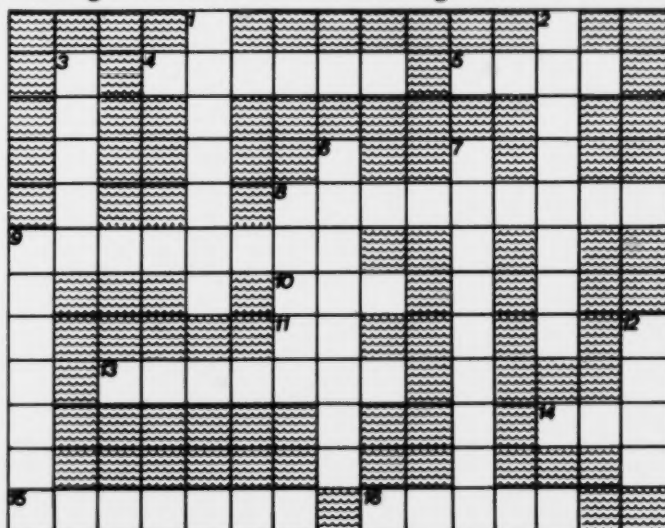
Crossword Puzzle

Across

4. Largest fish in the Atlantic Coral Reef; feeds on smaller fish
5. A mass of slowly accumulated limestone skeletons of animals called stony corals; the place where fish live. (Atlantic Coral _____)
8. A tough, flexible material which comprises the skeleton of sharks and rays (Open Ocean Tank)
9. An animal which preys on other animals
10. A relative of the shark (Open Ocean Tank)
11. For instance
13. A mouth brooding fish found in three African lakes and seen on level 3
14. Animal that migrates from Chesapeake Bay to Sargasso Sea to reproduce (level 3 graphics)
15. An eared seal (level 1)
16. Tiny plants which corals require to build a stony skeleton (zooxanthellae); also are found in plankton and are called phytoplankton (slides level 3)

Down

1. The locality or external environment in which a plant or animal lives
2. A freshwater turtle (level 2)
3. A marine mammal which depends on air trapped in a fur coat for insulation (pictures level 4)
6. A plant or animal that lives and feeds on or in another
7. The feeding habits of the tubeworm (level 3)
8. A tiny animal related to the sea anemones whose skeletons compose reefs
9. Birds that "fly" under water (level 4)
12. Huge seaweed that grows in dense stands along the California coast (level 4)



AQUARIUM CROSSWORD PUZZLE

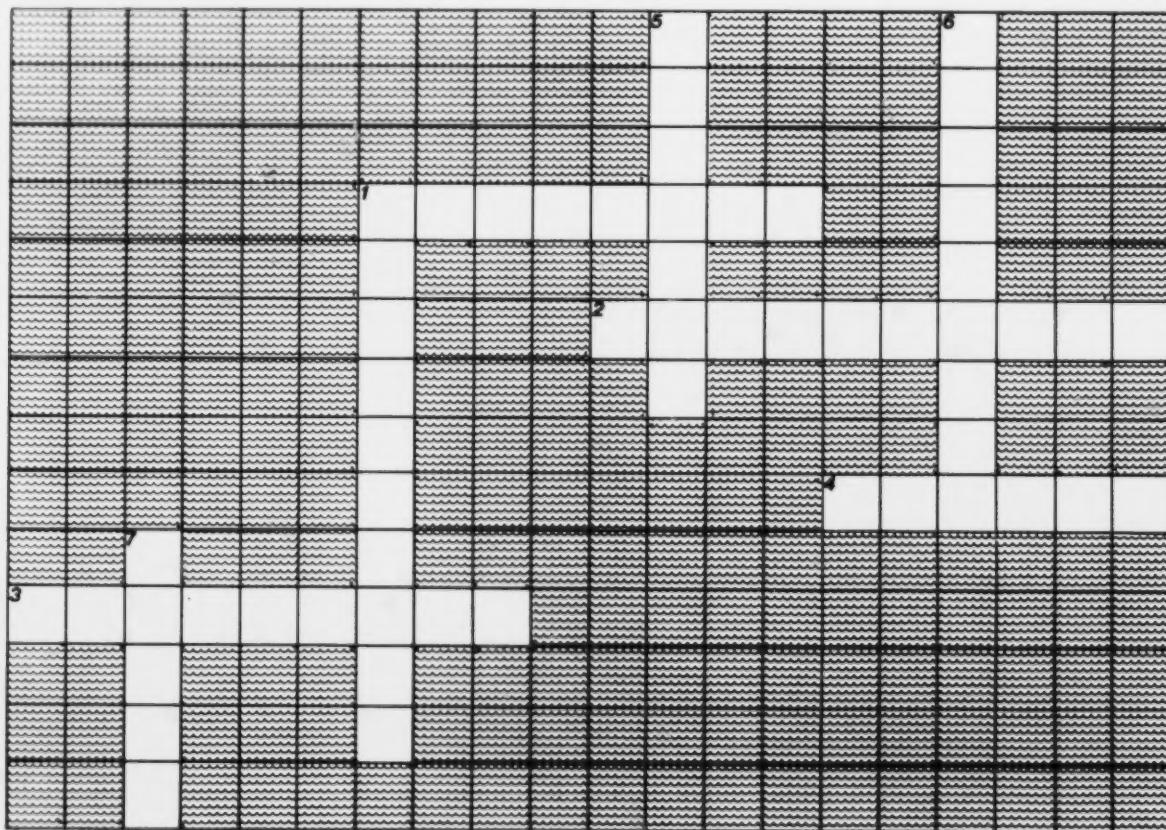
These are words or things you should have seen on your Aquarium visit.

Across

1. An artificial tank for the care and exhibition of living aquatic plants and animals
2. A jungle in the tropics
3. Swimming together of a large number of fish of the same kind
4. A bird that "flies" under water

Down

1. Characteristics that help an animal or plant survive
5. The locality or external environment in which a plant or animal lives
6. A habitat built up of skeletons of coral (two words)
7. A fish whose skeleton is made of cartilage



SOLUTIONS TO CROSSWORD PUZZLES

Aquarium Puzzle

Across

- 4. Tarpon
- 5. Reef
- 8. Cartilage
- 9. Predator
- 10. Ray
- 11. As
- 13. Cichlid
- 14. Eel
- 15. Sea lion
- 16. Algae

Down

- 1. Habitat
- 2. Red eared
- 3. Otter
- 6. Parasite
- 7. Filtering
- 8. Coral
- 9. Puffins
- 12. Kelp

Aquarium Crossword Puzzle

Across

- 1. Aquarium
- 2. Rain Forest
- 3. Schooling
- 4. Puffin

Down

- 1. Adaptation
- 5. Habitat
- 6. Coral Reef
- 7. Shark

CAREER AWARENESS ACTIVITY

Teacher Instructions

Students have great interest in working for institutions like zoos and aquariums. This interest is not usually matched with a full awareness of the opportunities, salaries, and job requirements.

In this activity, students will fill out a job worksheet twice: *once* from what they think a job entails and *second* after they have done some research about the work. This research could be followed by an oral or written comparison of the two forms.

To do the job research, students should go to the library and use books. Some references are listed on the back of the worksheet. Students could also talk to guidance counselors, the Maryland State Employment Service, Federal Job Information Center, or the local county Civil Service Office. Probably the best, but most difficult, part of the research would be to talk to the people doing the work. They are usually busy and do not get paid to talk to students. A good approach would be to put specific questions in writing. Calling will not usually yield results. Some of the job titles at the Aquarium are listed below and on the back of this sheet.

Aquarium Job Titles

Accountant	Administrative Assistant
Admissions Receptionist	Aquadopt Coordinator
Aquarist	Aquarist Trainee
Assistant to Associate Director	Assistant Chief of Security
Assistant Curator of Husbandry	Assistant Director of Administration & Finance
Assistant Director of Marketing	Assistant to Volunteer Coordinator
Associate Director	Audio Visual Technician
Aviculturist	Aviculturist Trainee
Bookkeeper	Business Manager
Carpenter	Cashier
Chief Engineer	Chief of Security
Clerk Typist	Communications Coordinator
Coordinator of Events	Curator of Education
Custodian	Curator of Operations & Husbandry
Development Aide	Development Coordinator
Director	Education Biologist
Education Trainee	Electrician
EEO Officer	Executive Secretary
Exhibits Technician	Filtration Engineer
Filtration Trainee	Gift Shop Supervisor
Graphics Designer	Groundskeeper
Group Events Coordinator	Groups Sales Representative
Head Cashier	Horticulturist
Intern	Laboratory Technician
Maintenance Mechanic	Mammalogist
Mammalogist Trainee	Manager of Membership & Adoption
Marketing Assistant	Membership Coordinator
Personnel Manager	Plumber

Program Coordinator
Receptionist
Secretary
Senior Aviculturist
Senior Custodian
Senior Vet Technician
Volunteer Coordinator

Purchasing Agent
Reservationist/Receptionist
Senior Aquarist
Senior Bookkeeper
Senior Engineer
Supervisor of Admissions
Volunteer

CAREER AWARENESS ACTIVITY

Job Worksheet

You will fill out this worksheet twice. Once *before* you research a job and once *after* you look up the information.

Your Name _____

Is this being filled out ____ before or ____ after doing your research?

1. Job Title: _____

2. Duties and Responsibilities:

3. Workplaces where this job is done:

a. _____

b. _____

c. _____

4. Salary:

a. Starting = \$ _____

b. Highest = \$ _____

5. Required education/training/experience:

6. Desirable education/training/experience:

7. If you had this job, identify the job to which you could be promoted _____

BIBLIOGRAPHY

1. Azrin, Nathan H. and Besalel, Victoria A., *Job Club Counselor's Manual*. University Park Press, 233 E. Redwood Street, Baltimore, MD 21202. 1980.
2. Boesch, Mark, *Careers in the Outdoors*. E. P. Dutton & Co., Inc., 2 Park Avenue, New York, NY 10016. 1975.
3. Bureau of Labor Statistics, *Exploring Careers*. U.S. Department of Labor, Washington, DC 20402.
4. Haldane, Bernard, and Jean, Martin, Lowell, *Job Power Now! The Young People's Job Finding Guide*. Acropolis Books Ltd., 2400 17th Street, NW, Washington, DC 20009. 1976.
5. Hardigree, Peggy, *Working Outside: A Career and Self-Employment Handbook*. Harmony Books, A Division of Crown Publishers, Inc., One Park Avenue, New York, NY 10016. 1980.
6. Hoppock, Robert, *Occupational Information: Where to Get It and How to Use It in Counseling and in Teaching*, 3rd Edition. MacGraw Hill, New York, NY. 1967.
7. Lathrop, Richard, *The Job Market*. The National Center for Job-Market Studies, P.O. Box 3651, Washington, DC 20007. 1978.
8. Lathrop, Richard, *Who's Hiring Who?* Ten Speed Press, Berkley, CA 94707. 1977.
9. Malnig, Lawrence R., and Morrow, Sandra L., *What Can I Do with a Major In. . .?* Saint Peter's College Press, 2641 Kennedy Boulevard, Jersey City, NJ 07306. 1975.
10. Miller, Donald B., *Careers '80/81*. Vitality Associates, P.O. Box 154, Saratoga, CA 95070. 1980.
11. Mitchell, Joyce Slayton, *The Work Book—A Guide to Skilled Jobs*. Bantam Books, Inc., 666 Fifth Avenue, New York, NY 10019. 1978.
12. National Council for Alternative Work Patterns, *First National Directory on Part-Time and Flexitime Programs*. 1925 "K" Street, NW, Suite 308A, Washington, DC 20036. 1978.
13. Rashad, Hohari M., *Federal Job-Hunting Simplified*. James H. McFadden Publications, P.O. Box 56252, Washington, DC 20011.
14. Superintendent of Documents, *Guide for Occupational Exploration*. U.S. Government Printing Office, Washington, DC 20402. 1979.
15. Superintendent of Documents, *The Outdoors and Your Career*. U.S. Department of Labor pamphlet, U.S. Government Printing Office, Washington, DC 20402. 1979.
16. Superintendent of Public Documents, *Dictionary of Occupational Titles*, 4th Edition. Washington, DC. 1977.
17. The Task Force on Education and Employment, *Education for Employment: Knowledge for Action*. Acropolis Books, Ltd., Colortone Building, 2400 17th Street, NW, Washington, DC 20009. 1979.
18. U.S. Department of Labor, *Occupational Outlook Handbook*. Washington, DC.
19. U.S. Department of Labor, *Occupational Outlook Handbook for College Graduates*. Washington, DC.
20. Zehring, John William, *Careers in State and Local Government*. Garrett Park Press, Garrett Park, MD 20766. 1980.

These slides have been chosen to help you prepare your class for a trip to the National Aquarium in Baltimore. They should be of benefit for several reasons:

- *Familiarization with a new environment. Studies of learning accomplished during field trips prove that children are distracted by new environments. Slides show our novel architecture which includes long spiral ramps, escalators, moving walkways over open spaces and revolving doors.*
- *Improved observations. The script and slides stress the importance of careful observation. Your students can practice observing and drawing conclusions during a slide show.*
- *Biological themes and concepts. Your students are introduced to some of the themes and concepts which form the basis for our exhibits. Among these are feeding and predator-prey relationships, coloration and its functions, moving, behavior and symbiotic partnerships.*

A VISIT TO THE AQUARIUM

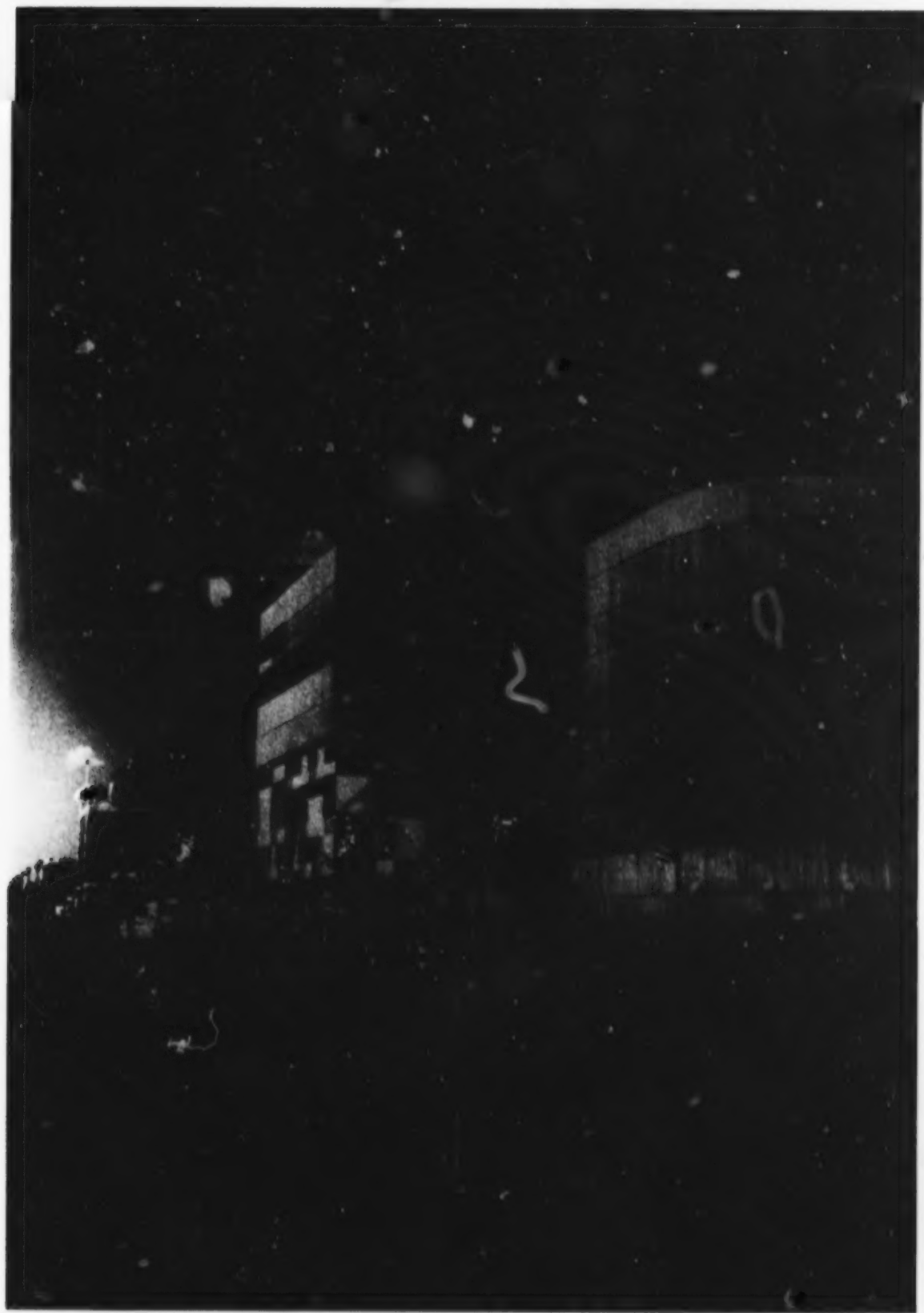
NO.	SUBJECT	SCRIPT
1.	Aquarium and moon with title	When you visit the Aquarium, you will travel from the Atlantic to the Pacific Ocean, from the deep sea to the Amazon Rain Forest.
2.	picture gridwall	All of the exhibits stress the Aquarium theme demonstrated by this wall of pictures "The Unity of Life through Water."
3.	bubble tubes and lobby	In the Lobby a row of "Bubble Tubes" sets the mood with color, light and sound and leads you out into . . .
4.	central space	a great open central space with layers of galleries connected by moving walkways.
5.	sea lion feeding	Sea lions live in the pool in this open space.
6.	sea lion feeding	Several times each day the mammalogists who care for them give demonstrations of their behavior.
7.	escalator	After a glance at the sharks you will see later, a right turn takes you to the escalator to level 2. The pictures of the many forms of water overhead and the sounds of water animals make the ride up quite exciting!
8.	graphic panel	Level 2 shows you how the water cycle works in Maryland with a trip across the state from . . .
9.	children at pond	the Appalachian pond where you can watch the rain fall . . .
10.	tidal marsh	to the Tidal Marsh where fresh water meets and mixes with salt water . . .
11.	killdeer	to Assateague beach and the continental shelf where water flows into the ocean. Fish, invertebrates, amphibians, reptiles and birds all join to make Maryland: Mountains to the Sea a fascinating exhibit.
12.	walkway and skeleton	Now turn and venture out onto a moving walkway over the sea lions and under the skeleton of a fin whale. It is a real skeleton from a whale killed a hundred years ago. Did you know whales are this big?
13.	picture gridwall	When you reach the next floor, a whole wall of pictures greets you. Can you see how fish and invertebrates have different mouths, fins, eyes and tails, each special to help the animal survive in its environment? You have arrived on Level 3 which will teach you about animal adaptations.
14.	hermit crab	The hermit crab shows special ways of picking food with its claws and protects itself by hiding in a snail shell.
15.	left: seahorse right: jawfish	Compare the mouths of these fish. The seahorse "slurps" up tiny animals as they pass by. How do you think the jawfish feeds?

NO.	SUBJECT	SCRIPT
16.	cichlid with egg mimic	This male African fish called a cichlid (pronounced sicklid) has a spot on its anal fin which looks like an egg. It is an adaptation or specialization which helps in reproduction.
17.	knifefish	Fish have different adaptations for moving too. Does this knifefish use its tail? Look at the waves passing along the bottom fin.
18.	wrasse	This colorful wrasse alternates resting on the bottom with paddling with its front fins called pectoral fins. How do most fish swim? With their tail.
19.	stomatid fish	Next slides and large pictures show the specializations of deep sea fish which live in the dark. This fish dangles a lighted lure to attract other animals which it eats.
20.	anemonefish	Sometimes animals live together and cooperate to the benefit of both. The anemonefish lives among the tentacles of certain large sea anemones. Normally the anemone's tentacles sting fish, but the anemonefish develops immunity and hides from its predators in the anemone's tentacles. The exact benefits to the anemone of this partnership are not known. People think the fish may attract prey for the anemone, or sweep dirt off the anemone, or even feed the anemone by dropping crumbs. When animals live together, it is called symbiosis.
21.	left: scorpionfish right: lionfish	Here are two fish that have different ways of discouraging predators—other fish that might eat them. The lionfish on the right has poisonous spines on its fins which it displays, advertising that it is dangerous. The scorpionfish on the left also has poisonous spines, but it hides from predators by having good camouflage.
22.	fin whale skeleton	Now it is time to leave the Adaptations level and ride a moving walkway to Level 4 where you will travel to distant parts of the world. There are also skeletons of other marine creatures to compare with the whale.
23.	puffins	You start on cliffs above the sea in Newfoundland where seabirds nest. Puffins live most of the year out in the stormy North Atlantic Ocean where they "fly" underwater, chasing the fish they eat. On the cliffs they dig burrows for their nests.
24.	feeding puffins	Twice each day you can watch the puffins and other seabirds being fed and hear their keeper talk about their biology.
25.	kelp forest	Next is a California kelp forest where fish swim among the blades of huge seaweed called kelp.
26.	kelpfish	Some of the fish hide from predators. Can you see this fish pretending it is a kelp blade in order to fool predators? It may also be waiting for a small fish to swim by that it can dart out and eat.
27.	garibaldi	Another kelp forest fish is the very bright garibaldi. Its color helps it advertise that it has a territory which it will defend. By advertising so other fish can see and avoid it, the garibaldi does not have to fight as often.

NO.	SUBJECT	SCRIPT
28.	Pacific reef	Now travel again. This time you have landed in the incredibly colorful Pacific coral reef where fish dart among the branches of animals called corals that are related to sea anemones.
29.	moorish idol and sailfin tang	The bright colors may help each fish recognize its own kind during mating. Or the colors may help advertise a territory or even blend in with the bright colors of the reef.
30.	naso surgeonfish	This surgeonfish is named for the sharp, cutting spines near its tail.
31.	cleaning wrasse and emperor angelfish	Partnerships are found in many habitats. Here is a cleaning wrasse which makes its living eating parasites off of other fish. Even though the host fish might normally eat smaller fish the wrasse's size, they recognize the wrasse's color pattern and hold still to get rid of their pests. The cleaner gets its food delivered and the big fish gets clean. When both animals benefit from a symbiotic relationship like this, it is called mutualism.
32.	Children's Cove	Tired of looking and want to get personally involved in an exhibit? Here is your chance in the Children's Cove.
33.	guide and children	Experienced Exhibit Guides will help you handle and study a wide variety of invertebrates including hermit crabs, sea urchins, starfish, whelks and the horseshoe crabs which you see with these children. Exhibit Guides throughout the Aquarium will help you learn new things just as this Guide is helping these students.
34.	revolving door	Cold from feeling like you have been underwater? Look for this revolving door which is the entrance to the tropical Amazon Rain Forest that tops the Aquarium. It is very warm and humid in a rain forest.
35.	rain forest	Plants grow everywhere in a tropical rain forest. It is warm all year and very wet. Because the plants are so abundant...
36.	iguana	you will have to look very carefully for the many animals from South America which live in the forest. Do you see the iguana here?
37.	hibiscus flower	There are beautiful flowers, too.
38.	piranha	And hundreds of fish in the ponds below the waterfalls. This is a piranha. They really are not as fierce as movies make them out to be. They generally eat other fish and plants.
39.	left: orange male cock-of-the-rock right: brown female	Sometimes males and females of the same kind of animal have very different colors. Here are a male Andean cock-of-the-rock (left) and a female. Can you see her? The male's bright colors help attract a female. Why do you think the female is so drab? Hint—she sits on the eggs.
40.	left: wading purple gallinule right: perching blue-crowned motmot	Look everywhere for animals, but be very quiet. Some like the gallinule walk on the ground. Others like the blue-crowned motmot on the right perch on trees.

NO.	SUBJECT	SCRIPT
41. sloth		One of the mammals in the Rain Forest is a sloth. The sloth climbs branches and eats leaves. The sloth is not a monkey. Because it is so slow moving you might miss it. Ask the Exhibit Guide where the sloth is hiding.
42. yellow-headed Amazon parrots		Toward the end of your trip over paths and up and down stairs is a tree filled with pairs of Amazon parrots. Watch them climb and interact with each other. They use their beaks to help climb.
43. poison dart frogs		Finally, leave the Rain Forest by way of some exhibits which show small animals like this poison dart frog. Its skin produces a poison which some South American Indians use on their darts to paralyze small game animals. Why do you think the frogs have such a bright color pattern? Remember advertising? They are warning predators not to attack them because they are poisonous.
44. escalator and pictures		Time to cool off by heading down from the Rain Forest to the shore and then down into the waters of an Atlantic coral reef. Listen for sounds to change as you begin to descend.
45. ring tank-reef		The Atlantic Coral Reef is 13 ft. deep and has thousands of fish. As you walk down these ramps, it will feel like you are going diving. The ramps may be crowded. Don't run!!
46. lookdowns		The fish are all around you. These lookdowns swim day and night in schools. Where do you think they got their name?
47. hawksbill turtle		Not all the animals are fish! This is a hawksbill turtle, an animal which is an endangered species. People kill them for their pretty shells or take eggs from their nests on the beaches. Because turtles breathe air with lungs, the hawksbill has to surface sometimes; however, it can stay down a long time and sleeps wedged into the reef.
48. food preparation		Because there are so many kinds of fish in the Reef, they need lots of different kinds of food. What do you see here? Can you find shrimp, squid, and cut up fish? The tiny pink things are little shrimp-like animals called krill.
49. diver feeding fish		To make sure each fish gets something to eat and the big ones do not hog all the food, a diver feeds them by hand three times each day. Feeding time is exciting for you and the fish both.
50. shark ring tank		Now you will go out from the reef near shore and into the Open Ocean.
51. top: sand tiger shark bottom: brown shark		Two kinds of sharks you will see are brown sharks and sand tiger sharks. If you know that brown sharks have a smaller second fin on their back, can you tell which is the brown and which, the sand tiger? The smaller the second fin, the faster they swim.
52. sand tiger shark		Have you ever been this close to a nine foot shark? The teeth grow in rows and are very sharp, but fragile. As old ones break off, new ones move up and replace them.

NO.	SUBJECT	SCRIPT
53.	gift shop	You will go up an escalator to return to the Lobby where you entered. On your way out is the gift shop, Puffin Place.
54.	seal pool	<i>Outside is a pool with seals. Be sure you stop to visit them.</i>
55.	harbor seal	Most are harbor seals. You can tell seals from sea lions easily. Seals do not have ear flaps, just a hole where their ear is.
56.	grey seal	The big seal is a grey seal. In warm weather he likes to sunbathe. While he is the largest in the pool, he is shy. All the seals are upset by shouting so remember to be quiet outside the Aquarium just like you were inside.





**NATIONAL AQUARIUM
IN BALTIMORE.**

Pier 3/501 East Pratt Street
Baltimore, Maryland 21202